Dragino – DLOS8, LG308, LPS8, LIG16 Getting Started Guide for AWS IoT Core for LoRaWAN

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1 Document Information

1.1 Naming Conventions

The term "downlink device" or "endpoint device" is used in this document to refer to a LoRaWAN device that connects to a LoRaWAN "Gateway". The "Gateway" in turn, connects to AWS IoT Core for LoRaWAN.

1.2 Revision History (Version, Date, Description of change)

V1.0 Date 2021-May-11 Release

2 Overview

This document shows how to set up Dragino LoRaWAN gateway to work with AWS IoT Core for LoRaWAN.

3 Hardware Description

3.1 DataSheet

Support Hardware are: DLOS8:

<u>https://www.dragino.com/downloads/index.php?dir=LoRa_Gateway/DLOS8/&file=Datasheet_DLOS8_LoRaWAN_Ga</u> <u>teway.pdf</u>

LG308: <u>https://www.dragino.com/downloads/index.php?dir=LoRa_Gateway/LG308-</u>

LG301/&file=Datasheet_LG308_LoRaWAN_Gateway.pdf

LPS8:

<u>https://www.dragino.com/downloads/index.php?dir=LoRa_Gateway/LPS8/&file=Datasheet_LPS8_LoRaWAN%20Pic_o%20Station.pdf</u>

LIG16:

<u>https://www.dragino.com/downloads/index.php?dir=LoRa_Gateway/LIG16/&file=Datasheet_LIG16_LoRaWAN%20In</u> <u>door%20Gateway.pdf</u>

Above hardware has the same method to connect to AWS IoT Core for LoRaWAN. Suggested firmware version > lgw--build-v5.4.1615882321-20210316-1613

3.2 Standard Kit Contents

The gateway mentioned above already include power adapter, User still need a RJ45 cable to connect and configure it.

Above gateway can be found on Dragino Official Website: <u>https://www.dragino.com</u>

3.3 User Provided items

User needs a RJ45 cable and PC to configure the gateway.

3.4 3rd Party purchasable items

For gateway connection, above items are enough.

3.5 Additional Hardware References

Additional hardware from Dragino can be found on https://www.dragino.com

4 Setup your AWS account and Permissions

If you don't have an AWS account, refer to the instructions in the guide <u>here</u>. The relevant sections are **Sign up for** an AWS account and **Create a user and grant permissions**.

4.1 Overview

The high-level steps to get started with AWS IoT Core for LoRaWAN are as follows:

- 1. Set up Roles and Policies in IAM
- 2. Add a Gateway (see section Add the Gateway to AWS IoT)
- 3. Add Device(s) (see section Add a LoRaWAN Device to AWS IoT)
 - a. Verify device and service profiles
 - b. Set up a Destination to which device traffic will be routed and processed by a rule.

These steps are detailed below. For additional details, refer to the AWS LORaWAN developer guide.

4.2 Set up Roles and Policies in IAM

4.2.1 Add an IAM Role for CUPS server

Add an IAM role that will allow the Configuration and Update Server (CUPS) to handle the wireless gateway credentials.

This procedure needs to be done only once, but must be performed before a LoRaWAN gateway tries to connect with AWS IoT Core for LoRaWAN.

- Go to the <u>IAM Roles</u> page on the IAM console
- Choose Create role.
- On the Create Role page, choose Another AWS account.
- For Account ID, enter your account id.
- Choose Next: Permissions
- In the search box next to Filter policies, enter AWSIoTWirelessGatewayCertManager.
 - If the search results show the policy named *AWSIoTWirelessGatewayCertManager*, select it by clicking on the checkbox.
 - If the policy does not exist, please create it as follows:
 - Go to the <u>IAM console</u>
 - Choose **Policies** from the navigation pane.
 - Choose Create Policy. Then choose the JSON tab to open the policy editor. Replace the existing template with this trust policy document:

```
"Version": "2012-10-17",
"Statement": [
        {
          "Sid": "IoTWirelessGatewayCertManager",
          "Effect": "Allow",
          "Action": [
              "iot:CreateKeysAndCertificate",
              "iot:DescribeCertificate",
              "iot:ListCertificates",
              "iot:RegisterCertificate"
        ],
        "Resource": "*"
    }
]
```

• Choose **Review Policy** to open the *Review* page.

}

- For Name, enter AWSIoTWirelessGatewayCertManager. Note that you <u>must enter the</u> <u>name as AWSIoTWirelessGatewayCertManager and must not</u> use a different name. This is for consistency with future releases.
- For **Description**, enter a description of your choice.
- Choose **Create policy**. You will see a confirmation message showing the policy has been created.
- Choose Next: Tags, and then choose Next: Review.
- In **Role name**, enter *IoTWirelessGatewayCertManagerRole*, and then choose **Create role**.
- **Note** that you <u>must not</u> use a different name. This is for consistency with future releases.
- In the confirmation message, choose IoTWirelessGatewayCertManagerRole to edit the new role.
- In the Summary, choose the Trust relationships tab, and then choose Edit trust relationship.
- In the **Policy Document**, change the **Principal** property to represent the IoT Wireless service:

```
"Principal": {
    "Service": "iotwireless.amazonaws.com"
},
```

After you change the Principal property, the complete policy document should look like this:

```
{
   "Version": "2012-10-17",
   "Statement": [
        {
            "Effect": "Allow",
            "Principal": {
               "Service": "iotwireless.amazonaws.com"
            },
            "Action": "sts:AssumeRole",
            "Condition": {}
        }
    ]
}
```

• Choose Update Trust Policy to save your changes and exit.

At this point, you've created the IoTWirelessGatewayCertManagerRole and you won't need to do this again.

NOTE – The examples in this document are intended only for dev environments. All devices in your fleet must have credentials with privileges that authorize only intended actions on specific resources. The specific permission policies can vary for your use case. Identify the permission policies that best meet your business and security requirements. For more information, refer to <u>Example policies</u> and Security Best practices.

4.2.2 Add IAM role for Destination to AWS IoT Core for LoRaWAN

Prepare your AWS account to work with AWS IoT Core for LoRaWAN.

Create a policy that gives the role permissions to describe the IoT endpoint and publish messages to AWS IoT.

• Go to the <u>IAM console</u>

{

- Choose **Policies** from the navigation pane.
- Choose **Create Policy**. Then choose the **JSON** tab to open the policy editor. Replace the existing template with this trust policy document:

```
"Version": "2012-10-17",
"Statement": [
{
```

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```
"Effect": "Allow",
"Action":
[
"iot:DescribeEndpoint",
"iot:Publish"
],
"Resource": "*"
}
]
```

- Choose **Review Policy** to open the Review page. For Name, enter a name of your choice. For **Description**, enter a description of your choice.
- Choose **Create policy**. You will see a confirmation message indicating that the policy has been created.

Now create the Role:

}

- In the IAM console, choose Roles from the navigation pane to open the Roles page.
- Choose Create Role.
- In Select type of trusted entity, choose Another AWS account.
- In Account ID, enter your AWS account ID, and then choose Next: Permissions.
- Search for the IAM policy you just created by entering the policy name in the search bar.
- In the search results, select the checkbox corresponding to the policy
- Choose Next: Tags.
- Choose Next: Review to open the Review page.
- For **Role name**, enter an appropriate name of your choice. For **Description**, enter a description of your choice.
- Choose Create role. You will see a confirmation message indicating that your role has been created.

Update your role's trust relationship to grant AWS IoT Core for LoRaWAN permission to assume this IAM role when delivering messages from devices to your account

- In the IAM console, choose **Roles** from the navigation pane to open the **Roles** page
- Enter the name of the role you created earlier in the search window, and click on the role name in the search results. This opens up the Summary page.
- Choose the Trust relationships tab to navigate to the Trust relationships page.
- Choose Edit trust relationship. The principal AWS role in your trust policy document defaults to root, and must be changed. Replace the existing policy with this:

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Sid": "",
            "Effect": "Allow",
            "Principal": {
                "Service": "iotwireless.amazonaws.com"
            },
            "Action": "sts:AssumeRole",
            "Condition": {}
        }
    ]
}
```

• Choose **Update Trust Policy.** Under **Trusted entities**, you will see: *The identity provider(s) iotwireless.amazonaws.com.*

4.3 Add the Gateway to AWS IoT

4.3.1 Preparation

To complete setting up your gateway, you need:

- LoRaWAN region. For example, if the gateway is deployed in a US region, the gateway must support LoRaWAN region US915.
- Gateway LNS-protocols. Currently, the LoRa Basics Station protocol is supported.
- Gateway ID (Gateway EUI) or serial number. This is used to establish the connection between the LNS and the gateway. Consult the documentation for your gateway to locate this value.

User can get the Gateway ID from Dragino Gateway Web UI:

| Am | Amazon AWS IoT LoRaWAN | | | | | |
|----|------------------------|----------------------------------|-------------------------|------------|--|--------------------|
| s | ettings | | | | | |
| | CUPS URI | example: https://xxxxxxx.cups.lo | rawan.us-east-1.amazona | ws.com:443 | | |
| | Email | dragino-1baf44@dragino.com | | | | |
| | Gateway ID | a840411baf444150 | | | | |
| | CUPS trust | Not Found | 选择文件 | 未选择任何文件 | | Upload_CUPS_Trust |
| | Private key | Not Found | 选择文件 | 未选择任何文件 | | Upload_Private_key |
| | Cert pem | Not Found | 选择文件 | 未选择任何文件 | | Upload_Cert_pem |
| | | | | | | |

Save&Apply Cancel

• The gateway with the firmware version higher than lgw--build-v5.4.1615882321-20210316-1613 is required. (<u>Click here</u> to check gateway version).

4.3.2 Add the LoRaWAN Gateway

To register the Gateway with AWS IoT Core for LoRaWAN, follow these steps:

- Go to the <u>AWS IoT console</u>.
- Select Wireless connectivity in the navigation panel on the left.
- Choose Intro, and then choose Get started. This step is needed to pre-populate the default profiles.
- Under Add LoRaWAN gateways and wireless devices, choose Add gateway.
- In the Add gateway section, fill in the GatewayEUI and Frequency band (RF Region) fields.
- Enter a descriptive name in the **Name optional** field. We recommend that you use the GatewayEUI as the name.
- Choose Add gateway
- On the **Configure your Gateway** page, find the section titled **Gateway certificate**.
- Select Create certificate.
- Once the Certificate created and associated with your gateway message is shown, select Download certificates to download the certificate (xxxxx.cert.pem) and private key (xxxxxx.private.key). The cert.pem and private.key
 Add a note if your gateway requires files of a specific name or non-pem format.
- In the section **Provisioning credentials**, choose **Download server trust certificates** to download the CUPS (cups.trust) and LNS (lns.trust) server trust certificates.
- Copy the CUPS and LNS endpoints and save them for use while configuring the gateway.
- Choose **Submit** to add the gateway.
- The xxxxx.cert.pem, xxxxxx.private.key and cups.trust will be needed to upload to Gateway in <u>set up gateway</u> <u>section</u>.

4.4 Add a LoRaWAN Device to AWS IoT

4.4.1 Preparation

Locate and note the following specifications about your endpoint device.

- LoRaWAN region. This must match the gateway LoRaWAN region. The following Frequency bands (RF regions) are supported:
 - o EU868
 - o US915

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- o EU433
- MAC Version. This must be one of the following:
 - o V1.0.2
 - o v1.0.3
 - o v1.1
- OTAA v1.0x and OTAA v1.1 are supported.
- ABP v1.0x and ABP v1.1 are supported.

Locate and note the following information from your device manufacturer:

- For OTAA v1.0x devices: DevEUI, AppKey, AppEUI
- For OTAA v1.1 devices: DevEUI, AppKey, NwkKey, JoinEUI
- For ABP v1.0x devices: DevEUI, DevAddr, NwkSkey, AppSkey
- o For ABP v1.1 devices: DevEUI, DevAddr, NwkSEnckey, FNwkSIntKey, SNwkSIntKey, AppSKey

4.4.2 Verify Profiles

AWS IOT Core for LoRaWAN supports device profiles and service profiles. Device profiles contain the communication and protocol parameter values the device needs to communicate with the network server. Service profiles describe the communication parameters the device needs to communicate with the application server.

Some pre-defined profiles are available for device and service profiles. Before proceeding, verify that these profile settings match the devices you will be setting up to work with AWS IoT Core for LoRaWAN.

- Navigate to the <u>AWS IoT console</u>. In the navigation pane, choose **Wireless connectivity**.
- In the navigation pane, choose **Profiles**
- In the **Device Profiles** section, there are some pre-defined profiles listed.
- Check each of the profiles to determine if one of them will work for you.
- If not, select Add device profile and set up the parameters as needed. For US 915 as an example, the values are:
 - o MacVersion 1.0.3
 - o RegParamsRevision RP002-1.0.1
 - o MaxEirp 10
 - o MaxDutyCycle 10
 - o RfRegion US915
 - o SupportsJoin true
- Continue once you have a device profile that will work for you.
- In the **Service Profiles** section, there are some pre-defined profiles listed. Check each of the profiles to determine if one of them will work for you.
- If not, select Add service profile and set up the parameters as needed. As an example, the default service profile parameters are shown below. However, only the AddGwMetadata setting can be changed at this time.
 - o UlRate 60
 - o UlBucketSize 4096
 - o DIRate 60
 - o DlBucketSize 4096
 - o AddGwMetadata true
 - o DevStatusReqFreq 24
 - o DrMax 15
 - o TargetPer
 - o MinGwDiversity 1

Proceed only if you have a device and service profile that will work for you.

5

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4.4.3 Set up a Destination for device traffic

Because most LoRaWAN devices don't send data to AWS IoT Core for LoRaWAN in a format that can be consumed by AWS services, traffic must first be sent to a Destination. A Destination represents the AWS IoT rule that processes a device's data for use by AWS services. This AWS IoT rule contains the SQL statement that selects the device's data and the topic rule actions that send the result of the SQL statement to the services that will use it.

For more information on Destinations, refer to the AWS LoRaWAN developer guide.

A destination consists of a Rule and a Role. To set up the destination:

- Navigate to the <u>AWS IoT console</u>. In the navigation pane, choose **Wireless connectivity**, and then **Destinations**
- Choose Add Destination
- On the Add destination page, in the **Permissions** section select the IAM role you had created earlier, from the drop-down.
- Under **Destination details** enter *ProcessLoRa* as the **Destination name**, and an appropriate description under **Destination description optional**.

NOTE: The Destination name can be anything. For getting started and consistency, choose *ProcessLoRa* for the first integration with AWS IoT Core for LoRaWAN.

- For **Rule name** enter *LoRaWANRouting*. Ignore the section **Rules configuration Optional** for now. The Rule will be set up later in the "Hello World" sample application see <u>Create the IoT Rule for</u> the destination
- Choose Add Destination. You will see a message "Destination added", indicating the destination has been successfully added.

4.4.4 Register the Device

Now register an endpoint device with AWS IoT Core for LoRaWAN as follows:

- Go to the <u>AWS IoT console</u>.
- Select **Wireless connectivity** in the navigation panel on the left.
- Select **Devices**
- Choose Add wireless device
- On the Add device page, select the LoRaWAN specification version in the drop-down under Wireless device specification.
- Under LoRaWAN specification and wireless device configuration, enter the DevEUI and confirm it in the Confirm DevEUI field.
- Enter the remaining fields as per the OTAA/ABP choice you made above.
- Enter a name for your device in the Wireless device name optional field.
- In the **Profiles** section, under **Wireless device profile**, find a drop-down option that corresponds to your device and region.
 - NOTE: Compare your device details to ensure the device profile is correct. If there are no valid default
 options, you will have to create a new profile (see the section <u>Verify Profiles</u>).
- Choose Next
- Choose the destination you created earlier (*ProcessLoRa*) from the drop-down under **Choose destination**.
- Choose Add device
- You will see a message saying "Wireless device added", indicating that your device has been set up successfully.

5 Set up the Gateway

5.1 Set up Gateway hardware

Dragino Gateway models LPS8,LIG16,DLOS8, LG308 all support AWS IoT Core for LoRaWAN, they have the same con figuration method to connect to AWS IoT Core for LoRaWAN. The example below uses LIG16 as reference.

5.1.1Choose the power supply

- For LIG16, Choose a 5V2A USB adapter.
- For other models, use the power adapter shipped with the devices.

5.1.2 LED Indicators

- \succ Power LED \bigcirc : This YELLOW LED will be solid on if the device is properly powered.
- **> HEART LED** : This GREEN LED will be solid on if there is LoRaWAN connection.
- > SYS LED :This LED will show different colors on different state:
- \checkmark ON: device have Internet connection.
- \checkmark BLINKING: a) Device has internet connection but no LoRaWAN Connection. or b)
- Device is in booting stage, in this stage, it will be BLINKING for several seconds.
- \checkmark OFF: device doesn't have Internet connection.
- > TRIANGLE LED >: No Function.
- \succ ETH LED \blacksquare : This LED shows the ETH interface physical connection status.
- ► WiFi LED ^{See}: This LED shows the WiFi interface connection status.
- •

5.1.3 Access the Internet with DHCP IP from router

Connect the Gateway's WAN port to your router and Gateway can obtain an IP address from the router to have internet access. In the router's management portal, you should be able to find what IP address the router has assigned to the Gateway. You can use this IP to connect to the gateway.

5.1.4 Gateway Connect via WiFi

At the first boot of Dragino gateway, it will auto-generate an unsecure WiFi network called dragino-xxxxxx

Note: It has been password protected and the password is: dragino+dragino

User can use the laptop to connect to this WiFi network. The laptop will get an IP address 10.130.1.xxx and the LG308 has the default IP **10.130.1.1**



Cancel

5.1.5 Access Configure Web UI

.....

Password

5.2 Set up Gateway Software

5.2.1 How to set up Gateway Software

The user only needs to set up the Amazon AWS IoT configuration UI at the gateway UI. LoRaWAN --> Amazon AWS IoT.

| 🝠 DRAGINO | LoRa 🔻 | LoRaWAN 🗸 | MQTT 🗸 | TCP 🗸 | Custom | Network 🕶 | System 👻 | LogRead▼ | Home | Logout |
|--|------------------|--|--------|---------------|------------|-----------|----------|-------------------|------|--------|
| Amazon AWS | loT Lo | oF LoRaWAN | | | | | | | | |
| Settings | | Amazon AW | 'S IoT | | | | | | | |
| CUPS URI | https://Af | N5T LORIOT | | st-1.amazonav | vs.com:443 | | | | | |
| Email | dragino-1 | 1ec3sc@uragino.com | | | | | | | | |
| Gateway ID | a84041ff | ff1ec39c | | | | | | | | |
| CUPS trust | cups.tru | ist | | 选择文件 | 未选择任何文件 | | U | pload_CUPS_Trust | | |
| Private key | 56e133 ccb202 | 75-0afd-4547-991 717199.private.key | 2- | 选择文件 | 未选择任何文件 | | U | pload_Private_key |] | |
| Cert pem | 56e133 ccb202 | 75-0afd-4547-991: 717199.cert.pem | 2- | 选择文件 | 未选择任何文件 | | U | pload_Cert_pem | | |
| Current Mode:LoRaWAN for AWS Save&Apply Cancel | | | | | | | | | | |

Detail of set up, please see Section 5.4

5.2.2 Firmware upgrade for Gateway

Dragino gateway firmware versions >= lgw--build-v5.4.1615882321-20210316-1613 support AWS-IoT LoRaWAN Core.

| ≶ DRAGINO | LoRa 🔫 | LoRaWAN 🔫 | MQTT 🗸 | TCP 🔻 | Custom | Network 🔫 | System 🔫 | LogRead ▼ | Home | Logout |
|--|--------------|-----------|--------|-------|--------|---------------------------------|---|----------------------|------|--------|
| Firmware Upo | late | | | | | | System (| Overview | | |
| | | | | | | | General | | | |
| Upload Firmware File Choose File No file chosen Upload Upload selected file. | | | | | | Back Up Remote I Firmware | / Restore Conf Mgmt و Upgrade الم | ig | | |
| Proceed with F | lash | | | | | | Reboot / | Reset | | |
| Preserve Setting Proceed | S 🗌 ancel | | | | | | Package | Maintain | | |

5.3 Additional Software References

5.3.1 website

- Company Website: <u>www.dragino.com</u>
- Gateway User Manual:
 - LIG16: <u>https://www.dragino.com/downloads/index.php?dir=LoRa_Gateway/LIG16/</u>
 - ✓ LPS8: <u>https://www.dragino.com/downloads/index.php?dir=LoRa_Gateway/LPS8/</u>
 - ✓ LG308: <u>https://www.dragino.com/downloads/index.php?dir=LoRa_Gateway/LG308-LG301/</u>
 - ✓ DLOS8: <u>https://www.dragino.com/downloads/index.php?dir=LoRa_Gateway/DLOS8/</u>
- more detail and troubleshooting on how to set up the gateway with AWS-IoT: <u>https://wiki.dragino.com/index.php?title=Notes_for_#Introduction</u>

5.3.2 support

Support Email : <u>support@dragino.com</u>

5.4 Configure the Gateway

5.4.1 How to Upload a certificate to Gateway

The user needs to upload the certificate obtained by AWS to the gateway by accessing the gateway AWS-IoT UI. Below is the update page in gateway:

| Ama | zon AWS lo | oT LoRaWAN | | |
|---------|----------------|---|-----------------------|--------------------|
| Set | tings | | | |
| | CUPS URI | example: https://xxxxxx.cups.lorawan.us-eas | t-1.amazonaws.com:443 | |
| I | Email | dragino-1baf44@dragino.com | | |
| | Gateway ID | a840411baf444150 | | |
| | CUPS trust | Not Found | 选择文件 未选择任何文件 | Upload_CUPS_Trust |
| | Private key | Not Found | 选择文件未选择任何文件 | Upload_Private_key |
| | Cert pem | Not Found | 选择文件未选择任何文件 | Upload_Cert_pem |
| | | | | |
| | Save&Apply Can | cel | | |
| User ne | ed to: | | | |

- a) Put the CUPS URI from AWS IoT Core From LoRaWAN to the CUPS URI field.
- b) Make sure the Gateway ID is the same the Gateway EUI from AWS-IoT portal.
- c) Upload the CUPS.trust file from AWS IoT Core for LoRaWAN to the Gateway
- d) Upload Private Key from AWS IoT Core for LoRaWAN to the Gateway
- e) Upload Cert Pem file from AWS IoT Core for LoRaWAN to the Gateway

CUPS.trust / Private Key/ Cert Pem file can be obtained from AWS IoT console, refer section <u>4.3.2 Add the LoRaWAN</u> <u>Gateway</u>

After upload the files and configure, user will be able to see below:

| Email | dragino-1ec39c@dragino.com | | |
|--------------|--|--------------|--------------------|
| Gateway ID | a840411ec39c4150 | | |
| CUPS trust | cups.trust | 选择文件 未选择任何文件 | Upload_CUPS_Trust |
| Private key | 0c8271de-ed00-4f71-ad3c- 64e20662f634.private.key | 选择文件未选择任何文件 | Upload_Private_key |
| Cert pem | 0c8271de-ed00-4f71-ad3c- 64e20662f634.cert.pem | 选择文件 未选择任何文件 | Upload_Cert_pem |
| | | | |
| Save&Apply C | ancel | | |

5.4.2 how to check firmware version

In System overview, user will see the Gateway version

| System> System overview | | | | | | | | |
|-------------------------|--|--------------------|--------|-------|--------|-----------|----------|------|
| S DRAGINC | LoRa 🗸 | LoRaWAN 🔻 | MQTT 🗸 | TCP 🔻 | Custom | Network 🔻 | System 🔻 | LogR |
| System Over | view | | | | | | | |
| Device Model: | LIG16 | | | | | | | |
| Hostname: | dragino-1ec3 | 39c | | | | | | |
| Firmware: | lgw-5.4.1615 | lgw-5.4.1615882321 | | | | | | |
| Build Time: | Build Tue Mar 16 16:12:01 CST 2021 | | | | | | | |
| FWD version: | Release:2021-03-16 04:12:50, Version:2.0.6 | | | | | | | |
| Cellular : | Not Detected | t | | | | | | |

Suggested firmware version is lgw--build-v5.4.1615882321-20210316-1613 or later

5.4.3 Get the latest firmware

User can get the firmware from this link and update the firmware: <u>https://www.dragino.com/downloads/index.php?dir=LoRa_Gateway/LIG16/Firmware/Release/</u> The file named as dragino-lgw-xxxx-squashfs-sysupgrade.bin is the upgrade Image.

5.4.4 How to upgrade

In gateway UI select System --> Firmware Upgrade

Firmware Update

Upload Firmware File

Choose File No file chosen



Proceed with Flash

| Preserve Set | ttings 🗆 |
|--------------|----------|
| Proceed | Cancel |

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Upload selected file.

Select the required image and click Upload. The image will be uploaded to the device, and then click Process to upgr ade.

NOTE: You normally need to uncheck the Preserve Settings checkbox when doing an upgrade to ensure that there is no conflict between the old settings and the new firmware. The new firmware will start up with its default settings

6 Add End Device(s)

When user connect the gateway to AWS IoT Core for LoRaWAN, user just needs to add the end device to AWS IoT Core for LoRaWAN and start it, and the end device will start communicating with the gateway

6.1 How to add end device

Read 4.4 and add the device to AWS IoT Core for LoRaWAN.

Or reference https://wiki.dragino.com/index.php?title=Notes_for_AWS-IoT-Core#Add_wireless_device

7 Verifying Operation – a "Hello World" example

As an example, add Gateway-Dragino-LIG16 to connect to <u>AWS IoT Core for LoRaWAN</u> and add Dragino End Device-L HT65 to communicate with the gateway.

Once setup is completed, provisioned OTAA devices can join the network and start to send messages. Messages from devices can then be received by AWS IOT Core for LoRaWAN and forwarded to the IOT Rules Engine.

Instructions for a sample Hello World application are given below, assuming that the device has joined and is capable of sending uplink traffic. The architecture for this sample application is:



7.1 Create lambda function for destination rule

Create the lambda function to process device messages processed by the destination rule.

- Start deployment of a serverless application with AWS Lambda function and AWS IoT Rule
- Select a decoder
- Review deployment
- Create the test event

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- provide PayloadData sample
- Run a test
- Note the AWS lambda function ARN
- Optional: review the source code of the binary decoder

Step 1: Start deployment of a serverless application with AWS Lambda function and AWS IoT Rule

Open AWS Lambda console by clicking on link

https://console.aws.amazon.com/lambda/home?region=us-east-

1#/create/app?applicationId=arn:aws:serverlessrepo:us-east-1:614797420359:applications/aws-iot-corelorawansampledecoder

| aws Services 🔻 | Q Search for services, frotures, marketplace products, and docs [Alt+5] | | | | | | | |
|--|--|---|--|--|--|--|--|--|
| AWS Lambda $\qquad \times$ | Lambda > Functions > Create function > Review, configure and deploy | | | | | | | |
| Dashboard Applications Functions | aws-iot-corelorawan-sampledecoder — version Review, configure and deploy | | | | | | | |
| Code signing configurations Layers | Application details | | | | | | | |
| Related AWS resources Step Functions state machines | Author Source code UBL Description Andrei Svirida https://github.com/aws-samples/aws-iot- core-lorawan Sample decoders for AWS IoT Core for LoRaWAN workshop | Report a vulnerability If you believe this application poses a security risk, please file a vulnerability report. | | | | | | |
| | ► Template | | | | | | | |
| | ► Permissions | | | | | | | |
| | ► License | | | | | | | |
| | | | | | | | | |
| | Readme file Application settings | | | | | | | |
| | Sample for workshop "AWS IOT Core for LORAWAN" Introduction This sample decoder is intended to be used in one of the labs of the "WMS IOT Core for LORAWAY workshop. Please refer to the workshop https://tector.amax.workshop.amax.workshop.amax.bit the sample.advorkshop. Please refer to the workshop https://tector.amax.workshop.amax.bit the sample.advorkshop. Please refer to the workshop https://tector.amax.workshop.amax.bit the sample.advorkshop. Please refer to the workshop https://tector.amax.workshop.amax.bit the sample.advorkshop.amax.bit the sample.advorkshop.amax.bit the sample.advorkshop.advorkshop.amax.bit the sample.advorkshop.advorks | malon | | | | | | |
| | Allowed values of DecoderName parameter are: • sample_device • dragino_lbt1 TopicOutgoingErrors | | | | | | | |

Step 2: Select a decoder

Please scroll down to the bottom of the page. Please provide the parameter DecoderName based on the following ta ble.

| Device | Decoder name |
|--------|---------------|
| LHT65 | dragino_lht65 |
| LBT1 | dragino_lbt1 |
| LSE01 | dragino_lse01 |
| LGT92 | dragino_lgt92 |
| LDS01 | dragino_lds01 |

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After that please check the box "I acknowledge that this app creates IAM roles and resource policies." and click on "Deploy".

| Readme file | Application settings |
|--|---|
| Sample for workshop "AWS IOT Core for LORAWAN" Droutcion This may decoder is intended to be used in one of the labs of the "AWS IOT Core for LoRAWAN" workshop. Please refers to the workshop https://iotore-forawan.workshop.aws for the guidelines on using this sample. The guidelines on using the gu | Application name The stack name of this application created via AWS CloudFormation aws-lot-corelorawan-sampledecoder1 DecoderName Name of decoder to use dragino_lgt92 * TransformLoRaWANBinaryPayloadRule TopicOutgoingErrors MQTT topic name to publish errors during the AWS IoT Rule invocation error/forawanworkshop TopicOutgoingTerrofsmedMessages MQTT topic name to publish transformed messages dt/lorawanworkshop/transformed et al. acknow ledge that this app creates custom IAM roles and resource policies. Info |
| | Cancel Previous Deploy |

Step 3: Review deployment

Please wait few seconds for a successful deployment. After that please click on the name of the Lambda function "Tr ansformLoRaWANBinaryPayloadFunction".

| aws Services v | Search for services, features, marketplace products, and docs | [Option+S] | 14749424889 • | N. Virginia 🔻 | Support 🔻 |
|---|--|--|--------------------------|--------------------|--------------|
| AWS Lambda × O Updated console (preview) Tell us what you think | Lambda > Applications > serverlessrepo-aws-iot-corel | orawan-sampledecoder | | | (|
| Dashboard <mark>Applications</mark> Functions | Overview Deployments Monitoring | | | | |
| Additional resources Code signing configurations Layers | Resources (5) Q. Filter by tags and attributes or search by keyword | | | C | |
| Related AWS resources Step Functions state machines | Logical ID | Physical ID | Type ⊽ | Last modified ⊽ | , |
| | TransformLoRaWANBinaryPayloadFunction | serverlessrepo-aws-iot-co-TransformLoRaWANBinaryPa- 184KL15U52QND | Lambda Function | 2 minutes ago | |
| | ansformLoRaWANBinaryPayloadRule 🖸 | $MyWorkshop LoRaWAN Rule With Decoder_dragino_lht 65$ | IoT TopicRule | 1 minute ago | |
| | TransformLoRaWANBinaryPayloadRuleActionRole | serverlessrepo-aws-iot-co-TransformLoRaWANBinaryPa- IHY1KLONRU9V | IAM Role | 2 minutes ago | |
| | | | | | |
| Feedback English (US) 🔻 | | © 2008 - 2021, Amazon Web Services, Inc. or its affiliat | es. All rights reserved. | Privacy Policy | Terms of Use |

Step 4: Create the test event

Please click on "Configure the test event"



In the window that opens, please provide the event name e.g. IoTCoreForLoRaWANEvent. After that please paste th e following JSON content:

```
{
  "PayloadData": "<Sample PayloadData>",
  "WirelessDeviceId": "57728ff8-5d1d-4130-9de2-f004d8722bc2",
  "WirelessMetadata": {
   "LoRaWAN": {
    "DataRate": 0,
    "DevEui": "a84041d55182720b",
    "FPort": 2,
    "Frequency": 867900000,
    "Gateways": [
     {
      "GatewayEui": "dca632fffe45b3c0",
      "Rssi": -76,
      "Snr": 9.75
     }
    ],
    "Timestamp": "2020-12-07T14:41:48Z"
   }
  }
}
```

| | and test your function with the same events. Create new test event | |
|---|---|--|
| | Event template hello-world | |
| | Event name IoTCoreForLoRaWANEvent | |
| Lipping Lip | <pre>1 * { 2</pre> | |

Step 5: Provide PayloadData sample

Please replace the string **<Sample PayloadData>** in the JSON document with a sample payload for the device you sel ected in step 2 according to this table. After that please click on "Create".

| Device name | Sample PayloadDate |
|-------------|--|
| LHT65 | y6QHxgG4AQhmf/8= |
| LSE01 | AuHtlACmawQPVGM= |
| LGT92 | DSEAAAEVCMUGpAA= |
| LBT1 | DxwAAAIDQUJCQ0NEREVFRkYwMjcxMjFGNkFDMy0wNTk= |



Step 6: Run a test

Click on "Test"

| aws ≡ ⊘ | Se The te | ervices Q Search for s | ervices, features, marketplace | products, and doc [Option | i+S] ∑ ¢ | Administrator/svirida | i-lsengard @ 6147-9742-0359 | ✓ N. Virginia ▼ | Support | • i |
|------------|--------------|--|--------------------------------|---------------------------|-----------------|-----------------------|---|------------------|---------|--------|
| | Co | ode source Info | | | | | | Upload from 🔻 | | |
| | ^ | File Edit Find View Go | Tools Window | st 🔻 Deploy C | hanges deployed | | | К.Я. К У | ¢ | |
| | Q | Go to Anything (% P) | app.py | Execution result: × | | | | | | |
| | Environment | serverlessrepo-aws- construction acioma_w1.py dragino_lds1.py dragino_lds2.py dragino_lds2.py | • Execution result | | | | | | | |
| | | dragino_lht65.py dragino_lse01.py sample_device.py tabs_objectiocator.py aon.py | | | | | | | | |
| | | requirements.bt | | | | | | | | |
| Feedback | Enn | | | | @ 2008 - 2021 | Amazan Web Convises I | an an ite affiliatan All sights annan a | d Dubungu Daliau | Tourse | 61100 |

In the attribute TransformedPayloadData you can observe the result of binary decoding for the payload you specifie d in step 5. The output below assumes that you have selected "sample device" in step 2. It will contain other attributes if you have selected another decoder in step 2.

| Code source Info | | Upload from 🔻 |
|--|---|---|
| | View Go Tools Window Test * Deploy Changes deployed | : Q |
| Q Go to Anything (% | P) T Execution result: X • | |
| E = serveriessrepo- | ve O . Execution results | Status: Succeeded Max memory used: 49 MB Time: 10.63 ms |
| ege ege ege ege ege ege ege ege | <pre>(</pre> | |
| | Function Logs | |
| Runtime settings | Info | Edit |
| | | |

Step 7: Note the AWS lambda function ARN

As a preparation for the next step, please note the ARN of the deployed AWS Lambda function. We will need this AR N later to review the created AWS IoT Rule.

| serverlessrepo-av | ws-iot-co-TransformLoRaWANB | inarvPa-OUBTGL1F6WFU | |
|------------------------------|---|---|---|
| Throttle 🗇 Copy ARN | Actions V | | |
| ③ This function belongs to a | n application. Click here to manage it. | | × |
| | serverlessrepo-aws-iot- co-TransformLoRaWAN BinaryPa-QUBTGL1F6 WFU S Layers (0) | Description - Last modified 27 minutes ago Function ARN | |
| + Add trigger | | + Add destination arr:aws:lambda:us- east-1:614797420359:function:serverlessrepo-aws-iot-co TransformLoRaWANBinaryPa-QUBTGL1F6WFU Application | - |

Step 8 : Optional: review the source code of the binary decoder

Though not required for the purpose of this workshop, feel invited to switch to the "Code" section of the AWS Lamb da function and inspect the Python source code. You will find the decoders for the individual devices in the **directory decoders**. The AWS Lambda function handler is in file **app.py**

| Code source Info | | Upload from 🔻 |
|---|--|---|
| File Edit Find Go to Anything () T S * serverlessrep | View Go Tools Window Test • Deploy Channels decisioned (P) Tal Execution result × sample, device, p × | ** * |
| v directors e astora, e astora, e agric e a | <pre>24 *** Decodes a base64-encoded binary payload into JSON. *** Perometers Et.py 25 base64_input: str Base64_encoded binary payload ##0207 28 ##0207 29 ##0207 29 ##0207 29 ##0207 29 ##0207 29 ##0207 29 ##0207 29 ##0207 29 ##0207 29 ##0207 20 ##0207 20 ##0000 20 ##0000 20 ##0000 20 ##0000 20 ##0000 20 ##0000 20 ##0000 20 ##0</pre> | r "None", if not provided by the LNS or invoking function. raise an exception. 11 Python Spaces:4 (|
| Runtime setting | 5 Info | Edit |

7.2 Update the Destination rule and get device's payload

In this step, you update the IoT rule that forwards the device payload to your application. This rule is associated with the destination created earlier in <u>Set up a Destination for device traffic</u>.

- Find the IoT Rule
- · Create a Destination with IoT Rule (MyWorkshopLoRaWANRuleWithDecoder_dragino_lht65)
- Update the destination to the device
- · Check the payload
- Approach A with MQTT
- Approach B with Lambda

Step 1: Find the IoT Rule MyWorkshopLoRaWANRuleWithDecoder

Please put the IoT Rule name prefix **MyWorkshopLoRaWANRuleWithDecoder_** into the search field and click on the search symbol. The rule named **MyWorkshopLoRaWANRuleWithDecoder_<Decoder name>** should appear:

| AWS IoT $\qquad \times$ | AWS IoT | > Rules | | |
|---|---------|---|----------|--------|
| Monitor | Rules | | | Create |
| Activity | | | | |
| Onboard | Search | ndes Q | | |
| Manage | . N | lame | Status | |
| Fleet Hub | | WWorkshopLoRaWWNRuleWithDecoder_dragino_Iht65 | Enabled | |
| Greengrass | | | | |
| Wireless connectivity | | | Enabled | ••• |
| Intro | | | Enabled | |
| Devices | | | Enabled | |
| Profiles | | | Finished | |
| Destinations | | | Enabled | |
| Secure | | | Enabled | |
| ▶ Defend | 1.0 | | Enabled | |
| ▼ Act | | | Enabled | |
| Rules | | | | |
| Destinations | | | Enabled | |
| ▶ Test | | | | |
| | | | | |
| Software | | | | |
| Settings | | | | |
| Learn | | | | |
| Feature spotlight | | | | |

Step 2: Create a Destination with IoT Rule

$(MyWorkshop LoRaWAN Rule With Decoder_dragino_lht65)$

| AM Role | nie or create a new one Haw to create an IAM Bala |
|---|--|
| xiaoye-test | |
| Destination detail | LS Into |
| lostination description | n - optional |
| rovide a helpful descripti | ion of your destination. |
| rovide a helpful description Destination description | ion of your destination. |
| Enter a rule name of process the message | ne the rule or a rule/topic that will ge sent to this destination. |

Step 3: Update the destination to the device

| aws Services 🔻 | | Q Search for services, features, marketplace products, and docs | [Alt+S] | 🔀 💠 edwin chen 🔻 N. Virginia 🔻 Support 🔻 |
|---|--|---|---|---|
| AWS IOT × | AWS IoT > Wireless connectivity > Wireless devices | | | C |
| Monitor Activity | LoRaWAN Sidewalk | | | |
| Onboard | LeBaWAN devices (7) | | | Edit Delete Add wireless device |
| Manage | LORAWAN GEVICES (7) Info | | | |
| ▶ Fleet Hub | | | | < 1 > |
| Greengrass | | Name | Destination | Last Uplink Received At |
| Wireless connectivity | | | 100 | · · |
| Intro | 0 | | 100 | · · · |
| Gateways Devices | 0 | 1000 | 100 | · · |
| Profiles | A REAL PROPERTY AND A REAL PROPERTY. | | - | the second se |
| Destinations | 0 570515eren | | | · · |
| Secure | O dd5cc550-3c04-4864-9f0c-2aac5e66399e | LHT65-T868 | 13333 | April 23, 2021, 15:13:13 (UTC+0800) |
| Defend | | | in the second | N , LOUE 1, TOTOTOTOTOTOTOTOTOT |
| ▼ Act | | | | |
| Rules | | | | |
| Destinations | | | | |
| ▶ Test | | | | |
| | | | | |
| Software | | | | |
| Jeam | | | | |
| Feature spotlight | | | | |
| Documentation | | | | |

Step 4 Check the payload

Approach A with MQTT

| click the ru | le | | | |
|--|-----|--|---------|--------|
| AWS IoT | × | AWS IoT > Rules | | |
| Monitor Activity | - 1 | Rules | | Create |
| Onboard | - 1 | Search rules Q | | |
| ▶ Manage | - 1 | Name | Status | |
| Fleet Hub Communication | - 1 | MyWorkshopLoRa/WANRule/WithDecoder_dragino_IIt65 | Enabled | |
| Wireless connectivity | - 1 | ALCOHOLD BE AND A REAL PROPERTY OF A | Enabled | |
| Intro | - 1 | | Enabled | |
| Devices | - 0 | | Enabled | |
| Profiles Destinations | - 1 | | Enabled | |
| ▶ Secure | - 1 | | Enabled | |
| Defend | | Committee Commit | Enabled | |
| ▼ Act | - 1 | | Enabled | |
| Destinations | - 1 | | Enabled | |
| ▶ Test | - 1 | | | |
| Software | | | | |
| Settings | - 1 | | | |
| Learn | - 1 | | | |
| Feature spotlight | | | | |

Copy the Topic name

| AWS IoT | × | O Introducing the new AWS IoT console experience We're updating the console experience for you. Learn more [7] Try the new experiences and let us know what you think. You can turn off the new experience | | |
|---|---|--|--|--|
| Monitor Activity | | AWS IOT > Rules > MyWorkshopLoRaWANRuleWithDecoder_dragino_lht65 | | |
| Onboard Manage | | Configure action | | |
| Fleet Hub | | Republish a message to an AWS IoT topic | | |
| Greengrass Wireless connectivity | | AWS IOT REPUBLISH | | |
| Intro | | This action will republish the message to another AWS IoT topic. | | |
| Gateways | | *Topic 💿 | | |
| Devices | | dt/lorawanworkshop/transformed | | |
| Profiles | | | | |
| Destinations | | Quality of Service (2) | | |
| Secure | | 1 - The message is delivered one or more times. | | |
| Defend | | | | |
| ▼ Act | | Choose or create a role to grant AWS IoT access to perform this action. | | |
| Rules | | converlescrono.aus.int.co.TransformI.oPaW/MIRinan/Pa.VGVE031.8Y701 Create Pola Celert | | |
| Destinations | | servertessrepurawshort-ummisuoninituwawikwoninitynamon trustakt/91 | | |
| ▼ Test | | | | |
| Device Advisor | | | | |
| MQTT test client | | Cancel Update | | |
| Software | | | | |
| Settings | | | | |
| Learn | | | | |

Open MQTT test client and subscribe Topic

| aws Services 🔻 | | | Q Search for services, features, marketplace products, and docs [Alt+5] | | |
|---|---|--|--|--|--|
| AWS IoT | × | Introducing the new AWS IoT console ex We're updating the console experience for | perience you. Learn more [2] Try the new experiences and <u>let us know what you think.</u> You can turn off the new experience from the navigation menu. | | |
| Monitor Activity | | AWS IOT > MQTT test client | | | |
| Onboard | | MQTT test client Info | | | |
| Manage | | You can use the MQTT test client to monitor the MQTT messages being passed in your AWS account. Devices publish MQTT messages that are identified by topics to communicate their state to AWS IoT. AWS IoT ale | | | |
| Fleet Hub | | changes and events. You can subscribe to | MQTT message topics and publish MQTT messages to topics by using the MQTT test client. | | |
| Greengrass | | Subscribe to a topic Pub | lish to a topic | | |
| Wireless connectivity | | | | | |
| Intro | | Topic filter Info | h you want to subscribe. The tonic filter can include MOTT wildcard characters | | |
| Gateways | | dt/lorawanworkshop/transformed | | | |
| Devices | | | | | |
| Profiles | | Additional configuration | | | |
| Destinations | | Subscribe | | | |
| Secure | | | | | |
| Defend | | Subscriptions | Tanic | | |
| ▼ Act | | Subscriptions | юрс | | |
| Rules | | You have no topic subscriptions | Subscribe or select a topic to view incoming messages | | |
| Destinations | | Tou have no copic subscriptions. | Jubschie unseich a topic to view incoming messages. | | |
| ▼ Test | | | | | |
| Device Advisor | | | | | |
| MQTT test client | | | | | |
| Software | | | | | |
| Settings | | | | | |
| Loom | | | | | |
| | | | | | |

Get the payload



Approach B with Lambda

open lambda console and click the application

| AWS Lambda X | Lambda > Applications | |
|---|---|--|
| Dashboard Applications Functions | Applications (4) Info | |
| Additional resources Code signing configurations Layers | Name ▼ ○ serverlessrepo-aws-iot-corelorawan-sampledecoder33 | Description Sample decoder for AWS IoT Core for LoRaWAN workshop |
| Related AWS resources Step Functions state machines | | |
| | 0 | (and online it is in the internal of |

| Q Search for | services, features, marketplace products, and docs [Alt+S] | 💟 💠 edwin chen 🔻 N. Virginia 🔻 Support 🕈 |
|--|---|---|
| Lambda > Applications > serverlessrepo-aws-iot-core | lorawan-sampledecoder33 | |
| serverlessrepo-aws-iot-corelo | rawan-sampledecoder33 | |
| Overview Deployments Monitoring | | |
| | | |
| Resources (5) | | C |
| Q Filter by tags and attributes or search by keyword | | |
| Logical ID | Physical ID | Type ∇ Last modified ∇ |
| TransformLoRaWANBinaryPayloadFunction | serverlessrepo-aws-iot-co-TransformLoRaWANBinaryPa-A9S9CA6DPCBY | Lambda Function 11 days ago |
| TransformLoRaWANBinaryPayloadRule 🖸 | MyWorkshopLoRaWANRuleWithDecoder_dragino_lht65 | IoT TopicRule 11 days ago |
| TransformLoRaWANBinaryPayloadRuleActionRole | serverlessrepo-aws-iot-co-TransformLoRaWANBinaryPa-Y6YF03L8X791 | IAM Role 11 days ago |
| | C. Sateri for C | Cl. Sarch for service, instruction products, and addition Applications Exercises and additional products, and additional product |

View logs in CloudWatch

| | | | | Application serverlessrepo-aws-iot- | -corelorawan-sampledeo | oder33 | |
|--|--|---|--|--|--------------------------|--|---|
| Code Test Monitor | Configuration Aliases Versions | | | | | | |
| Metrics Logs Traces | | [| View logs in CloudWa | tch 🖸 View X-Ray trace | s in ServiceLens 🖸 | View Lambda Ir | isights 🖸 |
| budWatch Logs Insights Info nbda logs all requests handled by yo I most expensive function invocation | a sur function and automatically stores logs genee is across all function activity. To view logs for a | rated by your code through Amazon CloudWatch specific function version or alias, visit the Monito | Logs. To validate your cod r section at that level. | e, instrument it with custom log | ging statements. The fol | llowing tables list the | most recent |
| Desent investigat | | | | Add to dashboard | 1h 3h 12h 1d 3d | 1w custom - | |
| Recent Invocations | : Portuant D | : LogStroom | : Durati | ninMS : BilledDurationInMS | : MomorySotInMR : I | Memoryl LeadInMR | |
| 2021 04 27707/27/17 2007 | 627h9aa6 617h 4101 9640 0h2ad22adh19 | 2021/04/27/141 ATECT147777/270202040450469 | . Dulati | 7 | 120 A | 10 | |
| 2 2021-04-23T07:22:13.359Z | 241c1321-572d-43af-a613-1c3eac90fabe | 2021/04/23/[\$LATEST]d7337f27826240d59468aa | d4ec0671f3 2.11 | 2 | 128 4 | +0 | |
| 3 2021-04-23T07:21:13.318Z | 4b53e34b-37d2-44a5-8a73-b635f8f288d9 | 2021/04/23/[\$LATEST]d7337f27826240d59468aad | d4ec0671f3 15.91 | 16 | 128 4 | 18 | |
| 4 2021-04-23T07:20:13.249Z | 3106fb84-9537-4a4c-baa2-4d4e966afb46 | 2021/04/23/[\$LATEST]d7337f27826240d59468aad | d4ec0671f3 2.89 | 3 | 128 4 | 18 | |
| 5 2021-04-23T07:19:13.247Z | 2079d366-a551-43f6-aee9-32cc83207378 | 2021/04/23/[\$LATEST]d7337f27826240d59468aad | d4ec0671f3 2.09 | 3 | 128 4 | 18 | |
| | | | | | | | |
| OK 12 Billing | Log group details | | | | | | |
| OK 12 Billing Logs | Log group details | Creation time | | Stored bytes | | ARN | |
| OK 12 Billing Logs Log groups | Log group details Retention Never expire | Creation time | | Stored bytes | | ARN arn:aws:long | :us-east-1:0613; |
| OK 12 Billing Logs Log groups Insights | Log group details Retention Never expire | Creation time 11 days ago | | Stored bytes 276.03 KB | | ARN am:aws:logs /lambda/ser | :us-east-1:0613' verlessrepo-aws |
| OK 12 Billing Logs Log groups Insights Metrics | Log group details Retention Never expire KMS key ID | Creation time 11 days ago Metric filters | | Stored bytes 276.03 KB Subscription filters | | ARN am:aws:logs /lambda/see TransformLo | :us-east-1:0613' verlessrepo-aws RaWANBinaryP; |
| OK 12 Billing Logs Log groups Insights Metrics Explorer | | Creation time 11 days ago Metric filters 0 | | Stored bytes 276,03 KB Subscription filters 0 | | ARN amiawslogs /lambda/se TransformLo | :us-east-1:0613 verlessrepo-aws RaWANBinaryPa |
| OK 12 Billing Logs Insights Metrics Explorer Streams New | Log group details Retention Never expire KMS key ID - | Creation time 11 days ago Metric filters 0 | | Stored bytes 276.03 KB Subscription filters O | | ARN amiaws:logs /lambda/se TransformLo Contributor | :us-east-1:0613' verlessrepo-aws RaWANBinaryPa Insights rules |
| OK (12) Billing Logs Log groups Insights Metrics Explorer Streams (kee Events | Log group details Retention Never expire KMS key ID - | Creation time 11 days ago Metric filters 0 | | Stored bytes 276.03 KB Subscription filters 0 | | ARN am:aws:logs /lambda/see TransformLe Contributor - | :us-east-1:0613 verlessrepo-aws pRaWANBinaryP; Insights rules |
| OK 12 Billing Logs Insights Metrics Explorer Streams Siee Events Rules | ▼ Log group details Retention Never expire KMS key ID - | Creation time 11 days ago Metric filters 0 | | Stored bytes 276.03 KB Subscription filters 0 | | ARN am:aws:logs /lambda/se TransformLo Contributor - | :us-east-1:06131 verlessrepo-aws RaWANBinaryPa Insights rules |
| OK 12 Billing Logs Insights Hertics Explorer Streams (Ker) Events Rules Event Buses | Log group details Retention Never expire KMS key ID - | Creation time 11 days ago Metric filters 0 | | Stored bytes 276.03 KB Subscription filters 0 | | ARN amiaws:logs /lambda/ses TransformLe Contributor - | :us-east-1:0613' verlessrepo-aws RaWANBinaryPa Insights rules |
| OK 12 Billing Logs Logroups Insights Explorer Streams New Rules Event Buses ServiceLens | Log group details Retention Never expire KMS key ID - Log streams Metric filters Su | Creation time 11 days ago Metric filters 0 bscription filters Contributor Insights | Tags | Stored bytes 275.03 KB Subscription filters 0 | | ARN am:awslog /lambda/se TransformL Contributor - | :us-east-1:0613 verlessrepo-aws pRaWANBinaryPr Insights rules |
| OK (2) Billing Log groups Insights Metrics Explorer Stream Silee Event Sues Event Buses Service Lans Service Map | ► Log group details Retention Never expire KMS key ID - Log streams Metric filters Su | Creation time 11 days ago Metric filters 0 bscription filters Contributor Insights | Tags | Stored bytes 276.03 KB Subscription filters O | | ARN am:avs:log /fambda/se TransformL Contributor - | :us-east-1:0613 verlessrepo-aws oRaWANBinaryPr Insights rules |
| OK 22 Billing cogs Log groups Insights Vertics Explorer Streams files Event Buses Service Lens Service Map Traces | Log group details Retention Never expire KMS key ID - Log streams Metric filters Su | Creation time 11 days ago Metric filters 0 | Tags | Stored bytes 276.03 KB Subscription filters 0 | | ARN amävsslogg (Jambda/se TransformLa Contributor - | :us-east-1:0613 verlessrepo-aw: RaWANBinaryP Insights rules |
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| OK 22 Billing ogs Log groups Insights Explorer Streams (New Vents Event Buses Event Buses Event Buses Event Buses Event Ruses Event Ruses Event Ruses Service Map Traces Service Map Traces Performance monitaring Resources | Log group details Retention Never expire KMS key ID - Log streams Metric filters Su Log streams (3) Log stream or try prefix search Log stream | Creation time 11 days ago Metric filters 0 bscription filters Contributor Insights | Tags v Last | Stored bytes 276.03 KB Subscription filters 0 | | ARN amäavslog Transformu Contributor - | cus-east-1:0613 redessrepo-av; RRWANBinaryP Insights rules |
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| OK 22 Billing ogs Log groups Insights Explore Streams (New Vents Explore Vents Explore Vents Explore Vents Event Bues Event Bues Event Bues Event Bues Event Bues Service Map Traces Traces Performance monitoring Ambda Insights (New Performance monitoring | Log group details Retention Never expire KMS key ID - Log streams Metric filters Su Log streams (3) G. Filter log streams or try prefix search Log stream C. 2021/04/23/(\$LATEST]d7337237 | Creation time 11 days ago Metric filters 0 bscription filters Contributor Insights 826240d59468aad4ec0671f3 | Tags | Stored bytes 275.03 KB Subscription filters 0 event time -04-23 15:18:13 (UTC+08:00) | | ARN amawslogg Alambda/sa TransformLe Contributor - | us-east-1:0613 verlessrepo-aw RaWANBinaryP Insights rules |
| OK 62 Billing cogs cogs lnsights krisights Explorer Streams (iveo vents Rules Event Buses Service Map Traces Service Map Traces Service Map Traces Service Map Traces Service Map Traces Service Map Traces Container Insights New Resources Performance monitoring Lambda Insights New Container Insights New Container Insights New Container Insights New Container Insights New | | Creation time 11 days ago Metric filters 0 bscription filters Contributor Insights 7826240d59468aad4ec0671f3 6f45046acba52b9d49abbe12d | Tags ▼ Last 2021 2021 | event time -04-23 15:08:13 (UTC+08:00) -04-23 15:08:13 (UTC+08:00) | | ARN amävslög Transforu Contributor - | cus-east-1:0613 redessrepo-aw RRWANBinary Insights rules |
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7.3 Configuring Amazon SNS

We will use the Amazon Simple Notification Service to send text messages (SMS) when certain conditions are met.

- Go to the <u>Amazon SNS console</u>.
- Click on the menu in the left corner to open the navigation pane.
- Select Text Messaging (SMS) and choose Publish text message.
- Under Message type, select Promotional.
- Enter your phone number (phone number that will receive text alerts)
- Enter "Test message" for the **Message** and choose **Publish message**.
- If the phone number you entered is valid, you will receive a text message and your phone number will be confirmed.
- Create an Amazon SNS Topic as follows:
- In the navigation pane, choose **Topics**
- Select Create topic
- Under Details, select Standard
- Enter a name of your choice. Here we will use "text_topic".
- Choose Create topic
- Create a subscription for this topic:
- In the page for the newly created *text_topic*, choose the **Subscriptions** tab
- Choose Create subscription
- Select **Protocol** as *SMS* from the drop-down
- Under Endpoint, enter the previously validated phone number to receive the SMS alerts
- Choose Create subscription. You should see a "Subscription to text_topic created successfully" message.

7.3.1Add a rule for Amazon SNS notification

Now add a new rule to send an Amazon SNS notification when certain conditions are met in a decoded message.

- Navigate to the <u>AWS IoT console</u>.
- In the navigation pane, choose **Act**. Then, choose **Rules**.
- On the Rules page, choose Create
- Enter the Name as *text_alert*, and provide an appropriate Description
- Under **Rule query statement**, enter the following query:

```
SELECT DevEUI as device_id, "Temperature exceeded 25" as message,
Alert_Temp as temp, Humidity as humidity, Timestamp as time FROM
'project/sensor/decoded' where Alert_Temp > 25
```

- Choose Add action
- · Choose Send a message as an SNS push notification
- · Choose Configure action
- Under SNS target, select text_topic from the drop-down
- Select *RAW* under **Message format**
- Under Choose or create a role to grant AWS IoT access to perform this action, choose Create role.
- Enter a name for the role and choose Add action
- Choose **Create rule**. You should see a "Success" message, indicating that the rule has been created.

7.3.2 Test the rule for Amazon SNS notification

After adding the rule for Amazon SNS notification, we should receive text message when hitting the event.

- Send message from end Device using AT command: at+send:lora:1:01670110
- Here is the message from mobile after sending uplink message.

{"device_id":"393331375d387505 ","message":"Temperature exceeded 25","temp": 27.2,"time":"2021–02–22T07:58: 54Z"}

7.4 Send Downlink Payload

This section shows how to send downlink payload from <u>AWS IoT LoRaWAN Server</u> to end Device.

Please follow the instructions on How to Send Downlink Payload.

7.5 IoT Analytics

7.5.1 Introduction

We will use IoT Analytics to visually display data via graphs if there is a need in the future to do further analysis.

7.5.2 Create an IoT Analytics Rule

First create a rule

- Navigate to the <u>AWS IoT console</u>.
- In the navigation pane, choose **Act**. Then, choose **Rules**.
- On the Rules page, choose **Create**
- Enter the **Name** as *Visualize*, and provide an appropriate **Description**
- Under **Rule query statement**, enter the following query:
 - SELECT * FROM 'project/sensor/decoded'
- Choose Add action
- Select Send a message to IoT Analytics
- Choose Configure Action
- Choose Quick Create IoT Analytics Resources
- Under Resource Prefix, enter an appropriate prefix for your resources, such as LoRa
- Choose Quick Create
- Once the Quick Create Finished message is displayed, choose Add action.
- Choose Create rule. You should see a Success message, indicating that the rule has been created.

7.5.3 Configure AWS IoT Analytics

Set up AWS IoT Analytics as follows:

- Go to the <u>AWS IoT Analytics console</u>.
- In the navigation panel, choose Data sets
- Select the data set that was generated by the Quick Create in Create an IoT Analytics Rule
- In the **Details** section, **Edit** the **SQL query**.
- Replace the query with:

select Alert_Temp as temp, Humidity as humidity, DevEUI as device_id, Timestamp
as time from LoRa_datastore

- Under Schedule, choose Add schedule
- Under Frequency, choose Every 1 minute, and choose Save

7.5.4 Configure Amazon QuickSight

Amazon QuickSight lets you easily create and publish interactive BI dashboards that include Machine Learning-powered insights.

- Go to <u>AWS Management console</u>.
- From the management console, enter "QuickSight" in the "Search for services, features.." search box.
- Click on **QuickSight** in the search results
- If you haven't signed up for the service before, go ahead and sign up, as there is a free trial period.
- Select the **Standard** Edition, and choose **Continue**
- Enter a unique name in the field QuickSight account name
- Fill in the Notification email address
- Review the other checkbox options and change them as necessary. The AWS IoT Analytics option must be selected.
- Choose **Finish.** You will see a confirmation message.
- Choose Go to Amazon QuickSight
- Select Datasets
- Select New dataset
- Select AWS IoT Analytics
- Under Select an AWS IoT Analytics data set to import, choose the data set created in <u>Create an</u> IoTAnalyticsRule
- Choose Create data source, and then choose Visualize
- Select dataset created, then select **Refresh** or **Schedule Refresh** for periodic refresh of dataset.

7.6 Testing your "Hello World" Application

Using your device, create a condition to generate an event such as a high temperature condition. If the temperature is above the configured threshold, then you will receive a text alert on your phone. This alert will include key parameters about the alert.

You can also visualize the data set as follows:

- Go to the <u>AWS IoT Analytics console</u>
- Choose Data sets

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- Select the dataset created earlier
- Select **Content**. and ensure there are at least few uplink entries available in the data set.
- Go to the <u>QuickSight console</u>
- Choose New analysis
- Choose the dataset created in <u>Create an IoT Analytics Rule</u>
- Select time on the X-axis, Value as temp (Average) and Color as device_id to see a chart of your dataset.

8 Debugging

8.1 How to check the gateway is running properly to connect AWS-IoT

If you want to check that the gateway Station is running properly. You can open the Web UI and below position. **System Overview**



8.2 How to get Station Log

<u>User can access to the Linux console via SSH protocol.</u> Make sure your PC and the LIG16 is in the same network, then use a SSH tool (such as putty, SecureCRT) to access it. Below are screenshots:

If you want to check the Station Log, please run this command : cat /var/iot/station.log

8.3 Access the gateway Linux console

IP address: IP address of LIG16 Port: 22 or 2222 User Name: root Password: dragino (default)

| Regory. | |
|---|---|
| Session Logging Terminal Keyboard Bel Features Window Appearance Behaviour Input device | Basic options for your PuTTY session Specify the destination you want to connect to Host Name for IP address) 10.130.1.1 Connection type: Raw Telnet Riogn SSH Ser Load, save ar belete a stored session pd Sessions |
| Port 2: Type: SS Data Proxy Telnet Riogin B SSH | SH lout Settings Load Save Delete |
| | Obse window on ext: O Aways O Never Only on clean ext |

After log in, you will be in the Linux console and type command here.



If you want to check the Station Log, please run this command: cat /var/iot/station.log

| root@dragino-lec39c:~# cat /var/iot/station.log |
|---|
| 2021-03-22 06:12:49:303 [STS:INFO] LOGGING : / Var/10/Station.rdg (maxsize=1000000, rotate=5) 2021-03-22 06:12:49:306 [STS:INFO] Station Var : 2.0.6(mins-openwir/dragino) 2021-03-16.04:13:21 |
| 2021-03-22 06:12:49.306 [SYS:INFO] Package ver : (null) |
| 2021-03-22 06:12:49.306 SYS:INF0 proto EUI : a840:41ff:ff1e:c39c (station.conf) |
| 2021-03-22 06:12:49.306 [5YS:INFO] prefix EUI : ::1 (builtin) |
| 2021-03-22 06:12:49.306 [5YS:INFO] Station EUI : a840:41ff:ff1e:c39c |
| 2021-03-22 06:12:49.307 [SYS:INFO] Station home: ./ (builtin) |
| 2021-03-22 06:12:49.307 [SYS:INFO] Station temp: /var/tmp/ (builtin) |
| 2021-03-22 06:12:49.313 [SYS:INFO] DAEMON: Station process 12723 started |
| 2021-03-22 06:12:49.525 [TCE:INFO] Starting TC engine |
| 2021-03-22 06:12:49.526 [ICE:ERKO] NO IC UNI CONTIGUEDA |
| 2021-05-22 06:12:49.527 [CUP:INFO] Starting a COPS Session in 0 Seconds. |
| 201-05-22 00.12.49.527 [TCE:INFO] terminating To anging |
| 201-03-22 00.12.49.527 [CIE: INFO] ferminan a CIES session now |
| 201-03-22 06:12:49.528 [CUP:INFO] Connecting a consistent https://AN5TK945DGIAT.cups.lorawan.us-east-1.amazonaws.com:443 (trv #1) |
| 2021-03-22 06:12:49.531 [anv:INF0] ./cups.trust: |
| cert.version : 3 |
| serial number : 06:7F:94:57:85:87:E8:AC:77:DE:B2:53:32:5B:BC:99:8B:56:0D |
| issuer name : C=US, O=Amazon, CN=Amazon Root CA 1 |
| subject name : C=US, O=Amazon, OU=Server CA 1B, CN=Amazon |
| issued on : 2015-10-22 00:00:00 |
| expires on : 2025-10-19 00:00:00 |
| Signed Using : RSA WITH SHA-256 |
| RSA Key SIZE : 2048 DILS |
| Dasic Constraints : CAFErre, max_pathrenev |
| cert version - 3 |
| Serial number : 49+83+C4+64+97+3C+19+27+40+26+65+87+30+47+87+71+84+58 |
| issuer name : OU=Amazon web Services O=Amazon.com Inc. L=Seattle ST=Washington C=US |
| subject name : CN=AWS IOT Certificate |
| issued on : 2021-03-22 06:09:43 |
| expires on : 2049-12-31 23:59:59 |
| signed using : RSA with SHA-256 |
| RSA key size : 2048 bits |
| basic constraints : CA=taise |
| Key usage : Digital Signature |
| 2021-05-22 00:12:49:309 [AUC:INFU] 2021 02:20 00:12:52 625 [cumputere] Batrioving undate info from cump https://ANSTROASDCIAT.cump.longwap.uc.eost 1 pmproprise com:442 |
| 2021-05-22 00.12.55.025 [CUT.VENS] RELIEVING UPdate-Info from COPS fittps://Anstk94506JAT.Cups.forawan.US-EdSt-1.ama20naws.Com:443 |

If you are monitoring the Station Log in real time, first please run this command : cd /etc/station; station -f

| DR AGINO |
|--|
| wiFi, Linux, MCU, Embedded |
| ореният 18.06 Version: Dragino-v2 Igw-5.4.1615882321 Build Tue Mar 16.16:12:01 CST 2021 |
| www.dragino.com |
| noncediragino-lecige:-# cd /etc/station/; station -f filling process 12045 2021-03-22 00:17:34.950 SYS:INF0 Logging : stderr (maxsize=10000000, rotate=3) 2021-03-22 00:17:34.950 SYS:INF0 Logging : stderr (maxsize=10000000, rotate=3) 2021-03-22 00:17:34.950 SYS:INF0 procedure : fud0:14ffffle:139c 2021-03-22 00:17:34.950 SYS:INF0 station +er: 1: db0:14ffffle:139c 2021-03-22 00:17:34.950 SYS:INF0 station +er: 1: db0:14ffffle:139c 2021-03-22 00:17:34.950 SYS:INF0 station +er: 1: db0:14ffffle:139c 2021-03-22 00:17:34.950 SYS:INF0 station +er: 1: db0:14ffiffle:139c 2021-03-22 00:17:34.950 SYS:INF0 station +er: 1: db0:14fiffifle:139c 2021-03-22 00:17:34.950 SYS:INF0 station +er: 1: db0:14fin) 2021-03-22 00:17:34.950 SYS:INF0 station +er: 1: db0:14fin) 2021-03-22 00:17:34.950 SYS:INF0 station +er: 1: db0:14fin) 2021-03-22 00:17:35.154 Ttc::trub 2021-03-22 00:17:35.154 Sys:INF0 station +er: 1: db0:14fin) 2021-03-22 00:17:35.154 Ttc::trub Station +er: 1: 1: 1: 1: 1: 1: 1: 1: 1: 1: 1: 1: 1: |
| Let 1 Weiglow is 0.245:69:16:50:91:86:13:52:10:00:14:13:9C:00:124:107:54:40.76 Issuer name : 0U=Amazon web Services 0=Amazon.com Inc. L=Seattle ST=washington C=US subject name : 0.249-12-31 23:30:59 Signed using EAS with SMA-256 Basic constraints : CA=False Key usage : Digital Signarure 2021-03-22 00:17:35.05 [Cup:INF0] 2021-03-22 00:17:35.06 [CUP:INF0] 2021-03-22 00:17:35.06 [CUP:INF0] Starting a CUPS session in 0 seconds. 2021-03-22 00:17:35.06 [CUP:INF0] Starting a CUPS session in 0 seconds. 2021-03-22 00:17:35.06 [CUP:INF0] Starting a CUPS session in 0 seconds. 2021-03-22 00:17:35.06 [CUP:INF0] Starting a CUPS session in 0 seconds. 2021-03-22 00:17:35.06 [CUP:INF0] Starting a CUPS session in 0 seconds. 2021-03-22 00:17:35.06 [CUP:INF0] Starting a CUPS session in 0 seconds. 2021-03-22 00:17:35.06 [CUP:INF0] starting a CUPS session in 0 seconds. 2021-03-22 00:17:35.06 [CUP:INF0] starting a CUPS session in 0 seconds. 2021-03-22 00:17:35.06 [CUP:INF0] starting a CUPS session in 0 seconds. 2021-03-22 00:17:35.06 [CUP:INF0] starting a CUPS session in 0 seconds. 2021-03-22 00:17:35.06 [CUP:INF0] starting a CUPS session in 0 seconds. 2021-03-22 00:17:35.06 [CUP:INF0] starting a CUPS session in 0 seconds. 2021-03-22 00:17:35.06 [CUP:INF0] starting a CUPS session in 0 seconds. 2021-03-22 00:17:35.06 [CUP:INF0] starting a CUPS session in 0 seconds. 2021-03-22 00:17:35.06 [CUP:INF0] starting a CUPS seconds. |
| Serial number :06:/F:94:37:85:87:E8:AC:77:06:82:53:32:58:86:99:88:56:00 Tsuder name :C=U5, 0=Amazon, ON=Server CA 18, CN=Amazon subject name :C=U5, 0=Amazon, ON=Server CA 18, CN=Amazon Tssted on :2015-10-22:00:00:00 |

Note that if you log out then station will log out as well, requiring you to type the command cd /etc/station/; station -d.

9 Troubleshooting

9.1 For resolving common or potential problems

User gateway may not start Station properly and therefore cannot connect to AWS Please check: Is GWID consistent with AWS-Gateway EUI? Re-upload the certificate and Save&Apply it again

9.2 Firmware version

Firmware version must be lgw--build-v5.4.1615882321-20210316-1613 or newer. See here for how to <u>check version</u>.

9.3 Contact Dragino for Directly Support

If the above debugging is not possible

Please send mail to : support@dragino.com

10 OTA Updates Currently not supported.