Canāree AQM for Aruba Wireless Solutions

What's that hanging off your AP - it's a Canāree Air Quality Monitor!

Solution Deployment Guide – Version 1.10.0 Updated 8/18/22

Figure 1: Canāree AQM connected to USB Port on Aruba

Overview

Piera's Canāree line of Air Quality Monitors (AQMs) have been designed specifically and certified to interoperate with Aruba Access Points (APs) beginning with the 8.8 release of Mobility Controller or Instant AP (IAP) from Aruba/HPE and is validated with subsequent and newer releases by both companies.

With this release of 8.8 - Aruba became certified as a Microsoft Azure IoT Connectivity solution, enabling the AP or controller to securely provision and send/receive data to Azure's IoT Hub for Piera sensors connected to Aruba APs via the USB Port and for our AQMs to be mass-deployed and provisioned simply using Azure's Device Provisioning Service (DPS)

This guide covers planning your design, configuration and validation of the solution as well as troubleshooting guide and interoperability matrix. For more information contact us at support@pierasystems.com

Figure 2: There's a bird on this Aruba AP and its name is Canāree

Ideal Placement of AQMs

When planning the deployment of AQM in a building the ideal location for monitoring has a lot in common with AP Locations. Ceiling mounted APs above users about 10' height with a line of sight to users is a common deployment scenario for typical office buildings, especially with ceiling grid as shown in the picture above. With each AP covering 600-1000sq in for high density Wifi designs.

This placement of APs is often perfect for monitoring air quality through a building. With millions of APs already deployed in these locations our solution takes advantage of the USB-C Port on many Aruba APs to both power the Canāree AQMs and report data to the cloud. This eliminates the need to deploy additional power/network cables to add AQM in your environment greatly simplifying the deployment process which is an important consideration in large buildings.

USB Mounting Options

All Aruba 300 and 500 Series APs and many other models have USB Ports that can be used for Canaree AQM. Ceiling Mounted APs orient the USB Connector in the ideal direction for Canāree AQMs. However some Aruba APs such as 303-Series may require a USB 90* Adapter to orient the Canāree in a more compact design.

Various USB Adapters and Extension Cables can be used with Canāree on Aruba APs to change the orientation or extend the reach of the Canāree up to 10' from the Aruba APs USB Port.

Figure X: A 90* USB Adapter is preferred on the Aruba 303 Model seen above.
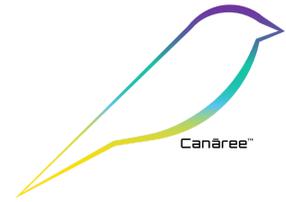
<u>Canāree Configuration for Aruba</u>

This solution supports both Canaree A-Series USB AQMs and Canaree IoT AQMs with the same USB connector. In both cases the Aruba AP is used to power the device as well as transport data from the USB Port to Piera's SenseiAQ Cloud running Azure IoT.

When deploying Canāree on an Aruba AP the configuration must be modified, to optimize message length and intervals.

The following values are set on Canāree CLI using a Terminal Program such as Putty or HyperTerm to restore factory defaults, enable low data mode (ldm), set the update interval to 60 seconds (interval) and optionally disable the Wifi radio (I-Series devices only) when connected directly to the Aruba AP.

Recommended Commands for all Canāree devices on Aruba

```
$Wfactory=

$Wldm=1

$Winterval=60
```

Optional Command to disable Wifi Radio on Canāree I-Series devices:

```
$WAPRadio=0
```

Note: The AP-Radio is enabled by default on Canāree I-Series for standalone Wifi connectivity; however when connecting directly to an Aruba AP (at such a short distance) it is recommended to disable the Canāree's Wifi Radio to avoid interference unless you are using a USB Extension cable to move the Canāree at least 3 feet away from the AP.
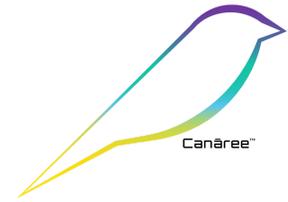
Aruba Configuration

ArubaOS 8.8 for Mobility Controller, VMC, IAP or Aruba Central is required to for communication with Piera sensors AOS 8.10 is recommended as it is a LTS release from Aruba and has all the latest IoT Hub logging features.

The following changes are required on Mobility Controller or IAP to allow forwarding of serial data from the Piera Sensor sensor data to the Azure-IotHub.

For testing we provide a demo Symmetric Key below; however for production you should request a specific key from support@pierasystems.com to secure your deployment.

Be sure the date/time and DNS is properly configured on your Aruba devices, using NTP is recommended to keep the time accurate which is critical for authenticating to the Azure IoT Hub.

Replace the *default* AP-group name with the AP-Group used in your environment for these APs.

```
iot transportProfile piera
endpointType Azure-IoTHub
 payloadContent serial-data
 bleDataForwarding
 usbSerialDeviceTypeFilter piera
 azure-dps-id-scope 0ne00284EE8
 azure-dps-auth-type group-enrollment symmetric-key
shlJLVynpurFpOW0n0yU0Lk/Q55Gw6DCJR3NtJ7d2vpF4WiujgIzqtnp8r3JdXDgbJHmTJksKZtiUum5jPYjVA
==
!
iot useTransportProfile piera
!
```

Apply the IoT-Transport Profile to your default (or other) AP-Group or if using Aruba central you can use IoT-Groups dedicated to Piera sensors.

Note: Ensure when you type in the symmetric-key there are no line or spaces in the output if you copy/paste from this document. You may need to copy the line to notepad or a plain text editor to validate that before pasting into the Aruba controller!


Aruba WebUI Configuration

If configuring the WebUI on Aruba is preferred follow this guide.
Step 1: Navigate to the Configuration -> Services -> IoT (Transport) and click + to create a new profile.

Select Azure IoTHub as the Service Type and enter the following settings into the configuration screen as shown below.
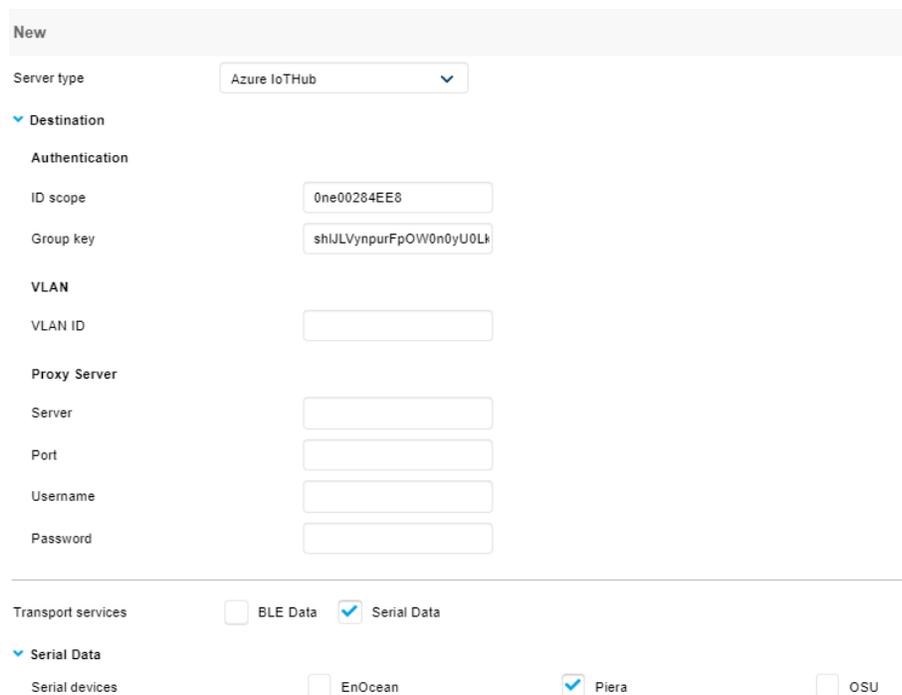
For Transport Services, select **Serial Data**
Under Serial devices, select **Piera**

Save the IoT Profile and apply it to AP-Groups that contain Piera sensors.
IoT Groups can also be used if available to limit IoT Transport to Piera-specific APs.
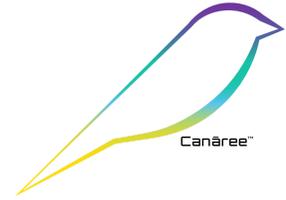
Firewall Ports required for Aruba's Azure IoT Transport.

Firewall Rules and Exemptions to permit Websockets/SSL for IAPs or Mobility Controllers may need to be opened to establish communication to the Piera cloud. The following outlines the ports required for communication. URL Filters may block Websockets or MQTT Communications and the Source IPs of Aruba's may need to be exempt from such filtering to transport the data.

Used by Standalone Canaree's for Cloud Connection

hostname: sensei.azure-devices.net

hostname: global.azure-devices-provisioning.net

TCP/443, 8883, 5671 (Websockets MQTT over TLS and Azure-IoT Transports)

hostname: pool.ntp.org

TCP/123 (NTP)   (Used by Standalone Canaree's to check NTP Time)

hostname: sensei.pierasystems.com

TCP/80 (HTTP)   (Used for WebUI access and Firmware Updates from Canaree devices)

TCP/443 (HTTPS) (Same as above, all connections are redirected to HTTPS

Aruba Validation / Troubleshooting

With a Canāree AQM connected to one or more APs and the above Iot transport profile configured, the device will attempt to register to the Azure cloud and begin to send data. This can be seen using the following troubleshooting commands on the Aruba MC/IAP.

- show clock (to validate time/date is set correctly)
- show version (to validate your version)
- ping google.com (to test DNS is working)

- show ap debug ble-config   (shows USB Port status active IoT Transport)
- show ap debug ble-relay iot-profile (shows DPS and Azure Registration Status)
- show ap debug ble-relay azure-iothub-log (Show IoT Connection log file)
- show ap debug ble-daemon (shows full log for IoT Messages sent/received)
- show ap debug usb-device-mgmt log (shows full log for USB devices identified on AP)

Always check the Clock and ensure the time is accurate, using NTP Is recommended to avoid issues.

```
Piera-Aruba505# show clock

Current Time    :2022-01-20 13:22:07
```

Use the following to validate your Version of Aruba OS running. Minimum supported version is 8.8.0.0

```
Piera-Aruba505# show version

Aruba Operating System Software.

ArubaOS (MODEL: 505), Version 8.9.0.0

Website: http://www.arubanetworks.com

(c) Copyright 2021 Hewlett Packard Enterprise Development LP.
```
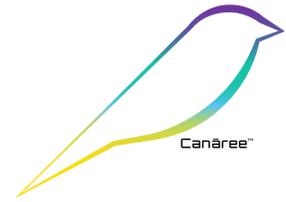
```
Compiled on 2021-08-16 at 09:59:14 PDT (build 81161) by jenkins
```

Validate DNS Is working properly on your MC/IAP Device, DNS Is required to register to Azure IoT Hub.

Piera-Aruba505# ping google.com

```
PING 142.250.189.206 (142.250.189.206): 56 data bytes

64 bytes from 142.250.189.206: icmp_seq=0 ttl=107 time=35.9 ms

64 bytes from 142.250.189.206: icmp_seq=1 ttl=107 time=35.6 ms
```

The following command validates the Piera USB Device was loaded successfully.

Piera-Aruba505# show ap debug usb-device-mgmt log | inc piera

```
2022-01-04  16:02:55.5840  5039  DEBUG  Plugin 'piera' was loaded successfully
```

The following command validates a specific AP is seeing the Piera Sensor on its USB Port and also reports the Serial Device ID (used for Azure DPS Registrations)

(ArubaMC-VA) #show ap debug ble-config ap-name Test315 | include PIERA

```
Radio Information  PIERA USB External

Serial Device Id   PIERA_USB:97f0f0bbf18db89fa9e8ad07bd4de670
```

The following command validates the Azure-IoT Connection has been successfully established, for registering and reporting of sensor data. Note the first connect and last update times shown

Piera-Aruba505# show ap debug ble-relay iot-profile
```
--------------------------Profile[aruba-demo]--------------------------
serverType                        : Azure IoTHub
deviceClassFilter                 : Serial Data
reportingInterval                 : 600 second
authentication-mode               : none
rssiReporting                     : Average
environmentType                   : office
```
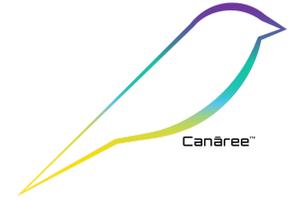
```
bleDataForwarding                  : TRUE
azure-dps-id-scope                 : 0ne00284EE8
azure-dps-group-key                : ************
Server Connection State
-------------------------
TransportContext                   : Ready
Last Data Update                   : 2022-01-20 13:12:15
Last Send Time                     : 2022-01-20 13:12:15
TransType                          : Azure AMQP Over Websocket
Transport count                    : 1
-------------------------
---------------Azure Transport[sensei.azure-devices.net]---------------
Transport url                      : sensei.azure-devices.net
Transport created                  : Yes
Device count                       : 1
-------------------------
Device MAC                         : b8:3a:5a:c0:18:da
Device id                          : B83A5AC018DA
Device created                     : Yes
Status                             : Connect success
Direct Method Status               : Idle
```

The following command shows the full log for Aruba's connectivity to Azure IoT Hub, including details about the device provisioning process, ID-Scope and Group key used to register.

(ArubaMC-VA) #show ble_relay azure-iothub-log

2022-01-04 16:03:39 Azure connect: Azure iothub init...

2022-01-04 16:03:39 Azure connect: Azure iothub init done

2022-01-04 16:03:39 Azure connect: az_iot_connecting(161) Start azure iothub connecting thread.

2022-01-04 16:03:39 Azure connect: New connecting, iothub url sensei.azure-devices.net, register id B83A5AC018DA, key ******

2022-01-04 16:03:39 az_iothub_creat_client_hash_entry(146): Created AP mac<b8:3a:5a:c0:18:da>, id <B83A5AC018DA>.

2022-01-04 16:03:39 Azure connect: az_iothub_create_device(230) creating client B83A5AC018DA

2022-01-04 16:03:39 Azure send: az_iot_sending_msg(235) Start azure iothub

sending thread.

2022-01-04 16:03:39 Azure connect: az_iot_connecting(202) Create device handler done.

2022-01-04 16:03:39 Azure connect: No more Azure IoTHub connecting request in the queue, stop connecting.

2022-01-04 16:03:39 Azure connect: Azure iothub connecting thread end.

2022-01-04 16:03:40 Azure connect: The device client B83A5AC018DA is connected to iothub

2022-01-04 16:03:40 Azure connect: Update azure connection status to daemon

The command below shows the full log of IoT Messages, which include keep alives and sensor data every 60 seconds.

Piera-Aruba505# show ap debug ble-daemon

2022-01-20 12:46:43 parse_apb_tlv:2164 TLV type (0x7b) and length(1) value(0, 00)

2022-01-20 12:46:43 prepare_ble_radio_profile_msg:4496 profile ABSENT cfg:0x001d

2022-01-20 12:46:43 parse_apb_keepalive:1220 in keepalive msg (slot=1), adv_payload=00000000000000000000000000000000000000000000000000000000000000, len=62, status=0

2022-01-20 12:46:43 parse_apb_keepalive:1272 fw return status is BEACON_SUCCESS(0)
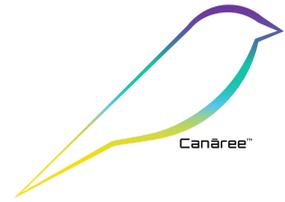
Map View Examples

A Map View is ideal for monitoring AQM on larger buildings, and often a similar Floorplan is used to monitor Wireless network itself. Piera provides example code for Google Maps integration, which allows you to overlay a JPG floor plan, or use real Google Maps to place your AQMs on a custom map for easy viewing.

Figure X: 3D Map View of Air Quality using Google Maps feature

Figure X: Typical 2D Floor Plan Map with Air Quality Monitoring

Example Code is available at our GitHub SIte on https://github.com/PieraSystems/map-test

A live Demo MAP can be viewed online at https://sensei.pierasystems.com/map/index.html

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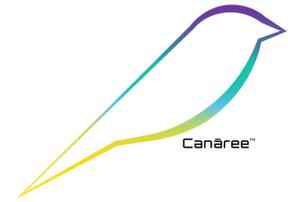
Canāree Specifications

Technical Data	
USB-Serial Driver	Silicon Labs CP2102 UART Bridge
Wireless LAN Support (Canāree I-Series only)	802.11n 2.4 GHz using WPA2/PSK/AES (Client)
Power Consumption	100mA @ 5.5v (Continuous Operation) A-Series 120mA @ 5.5v (Continuous Operation) I-Series
Total Airflow	0.1 LPM
USB Connector Type	Type A - USB 2.0, (max 10' cable extension)
Physical Dimensions	9cm x 7cm x 2cm (3.54" x 2.76" x 0.79")
Weight *	50g (1.76 oz)
Software Supported	SenseiAQ (Windows / MacOS) Application
Cloud Reporting Support	Microsoft Azure IoT Hub*
Power Saving and Cleaning Mode	Supported
Storage Temperature Range	-40°C to +80°C

Table 3. Absolute minimum and maximum ratings

*1 Year subscription included with purchase of device. Extended subscriptions available with maintenance contract.

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