MangOH Arduino Tutorial

Document #:	***N/A***
Revision:	**DRAFT 1.0**
Document Type:	**Tutorial**
Customer Name :	***N/A***
Author:	**David Clark**
Location:	**Richmond**
Date:	**November 2015**

1 Summary of Document

This document contains a tutorial on how to update an existing Arduino sketch and have the data read by sketch updated on AirVantage. In addition, data updates from AirVantage will also be interpreted by the updated Arduino sketch.

2 Introduction

Software has been created for the MangOH project to allow Arduino sketch writers to use the Arduino Yun Bridge to push and retrieve data to/from AirVantage (or other Legato applications). For this tutorial we will start with a sketch measuring temperature and humidity.

Note it is assumed that the following has already been completed before starting this tutorial:

- The Arduino software has already been installed on the user's PC. See https://www.arduino.cc/en/Main/Software to install the Arduino software.
- The legato toolset has already been installed on the user's Linux PC.
- The user has an AirVantage account
- The MangOH device has already been configured on AirVantage

3 Arduino Sketch

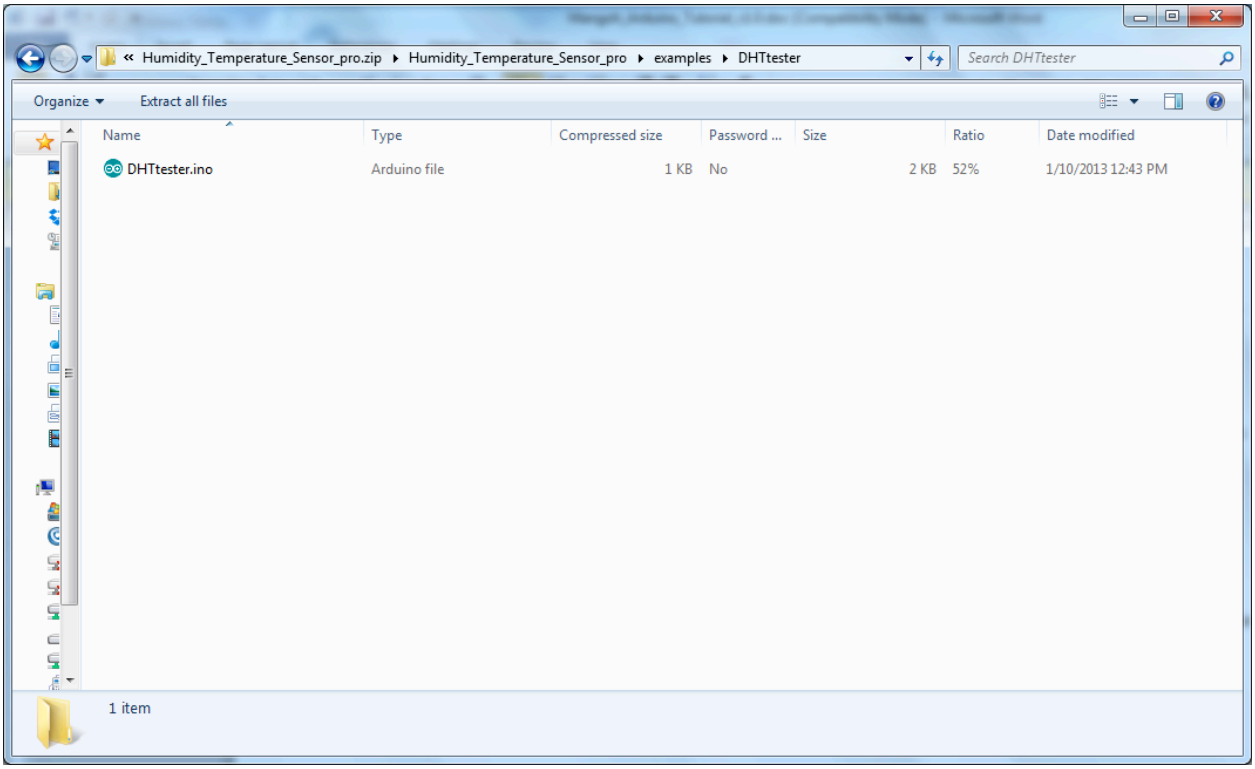
The Arduino sketch for this tutorial was retrieved from http://www.seeedstudio.com/wiki/File:Humidity_Temperature_Sensor_pro.zip.

3.1 Load and Running Sketch

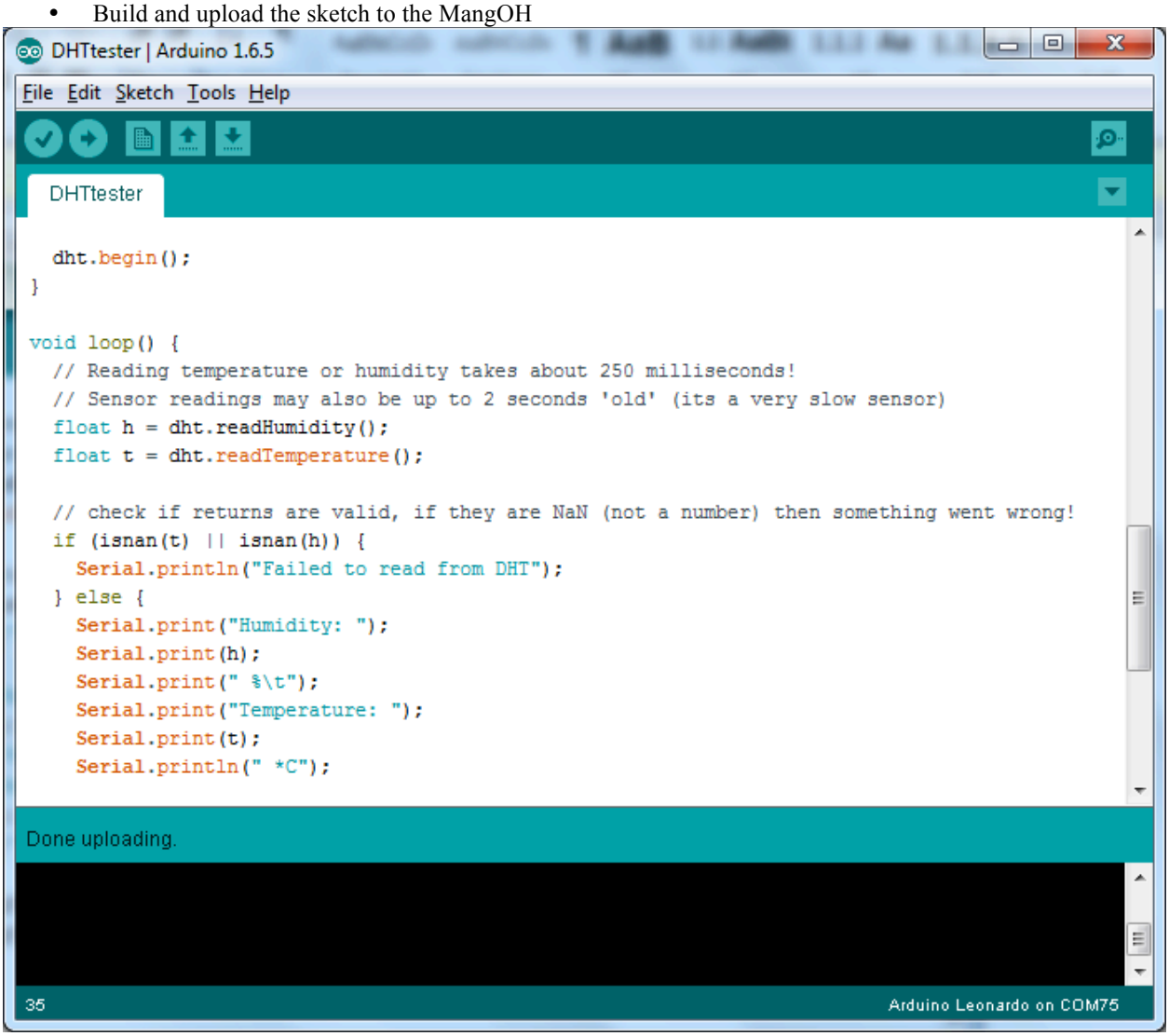
Execute the following steps to run the sketch:

- Hardware set-up:
  - Attach shield to Mangoh board
  - Attach temperature/humidity sensor to pin D2 on the shield
  - Connect USB cable from Mangoh to PC
- Extract the .zip file to a local folder. The contents of the zip file extracted in the *Humidity_Temperature_Sensor_pro* folder.

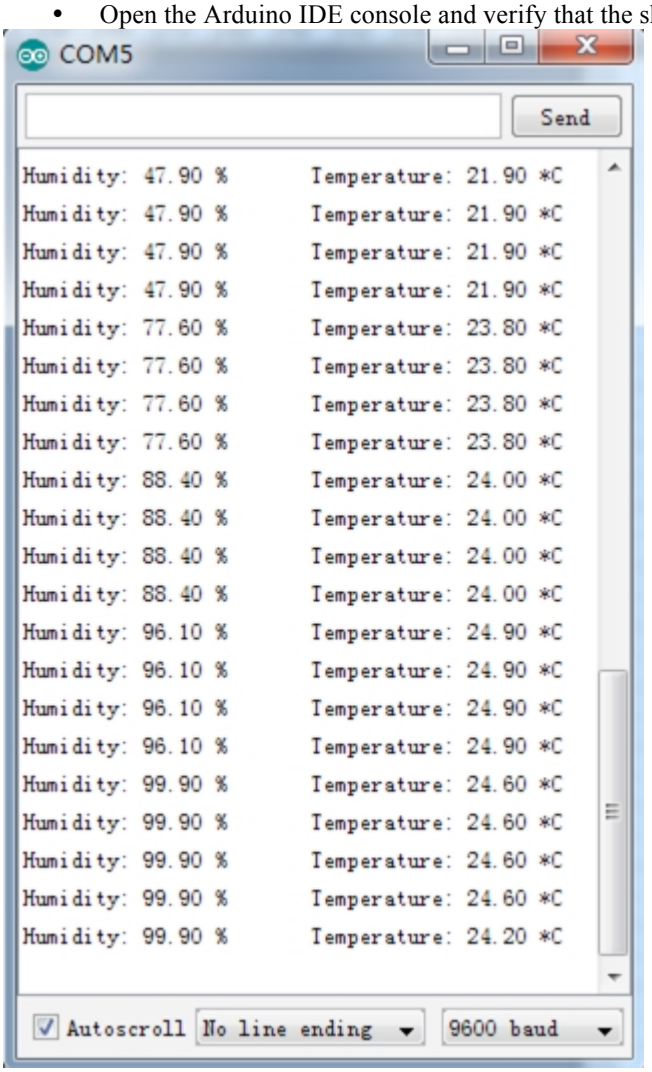
- Open the Arduino sketch *DHTester.ino* file found in the examples folder



- Build and upload the sketch to the MangOH



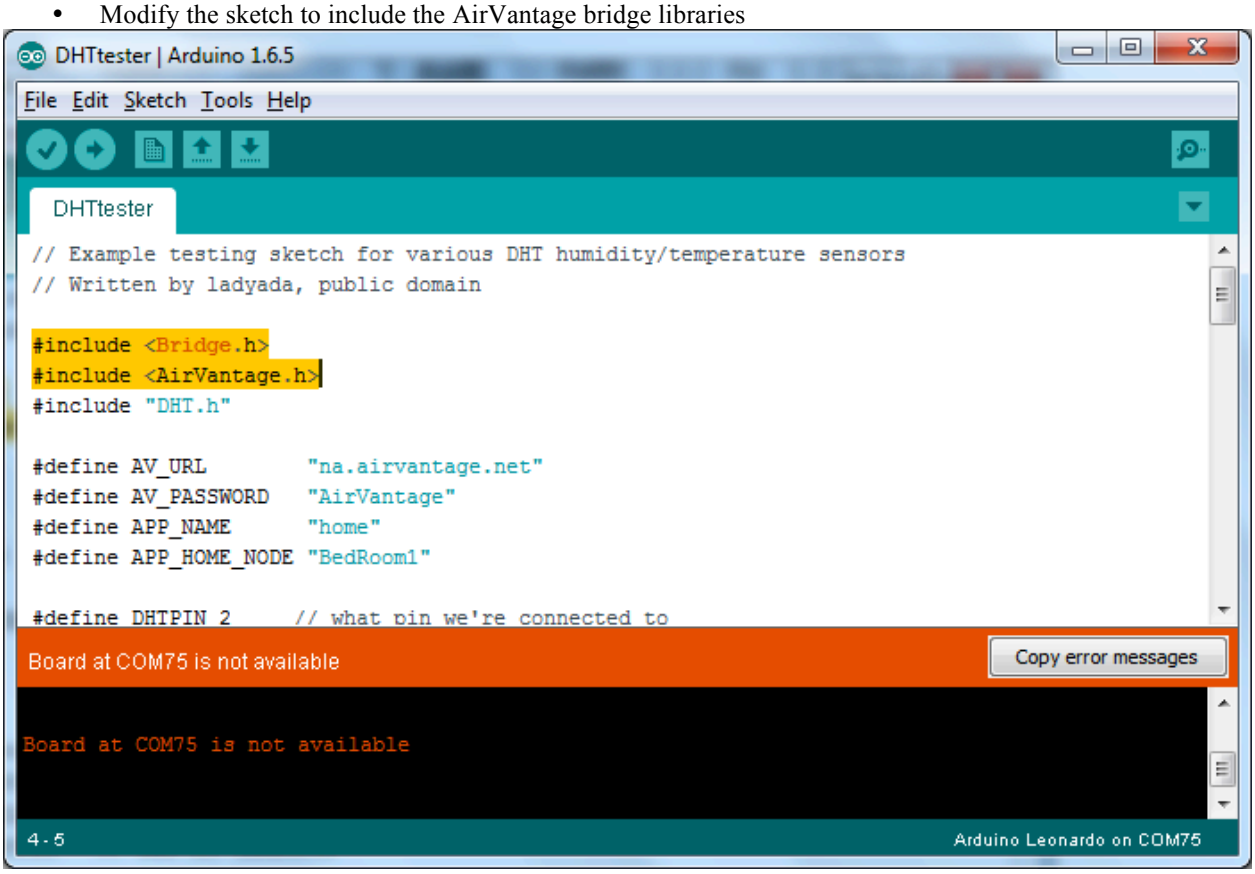
- Open the Arduino IDE console and verify that the sketch is operating and reading correct values



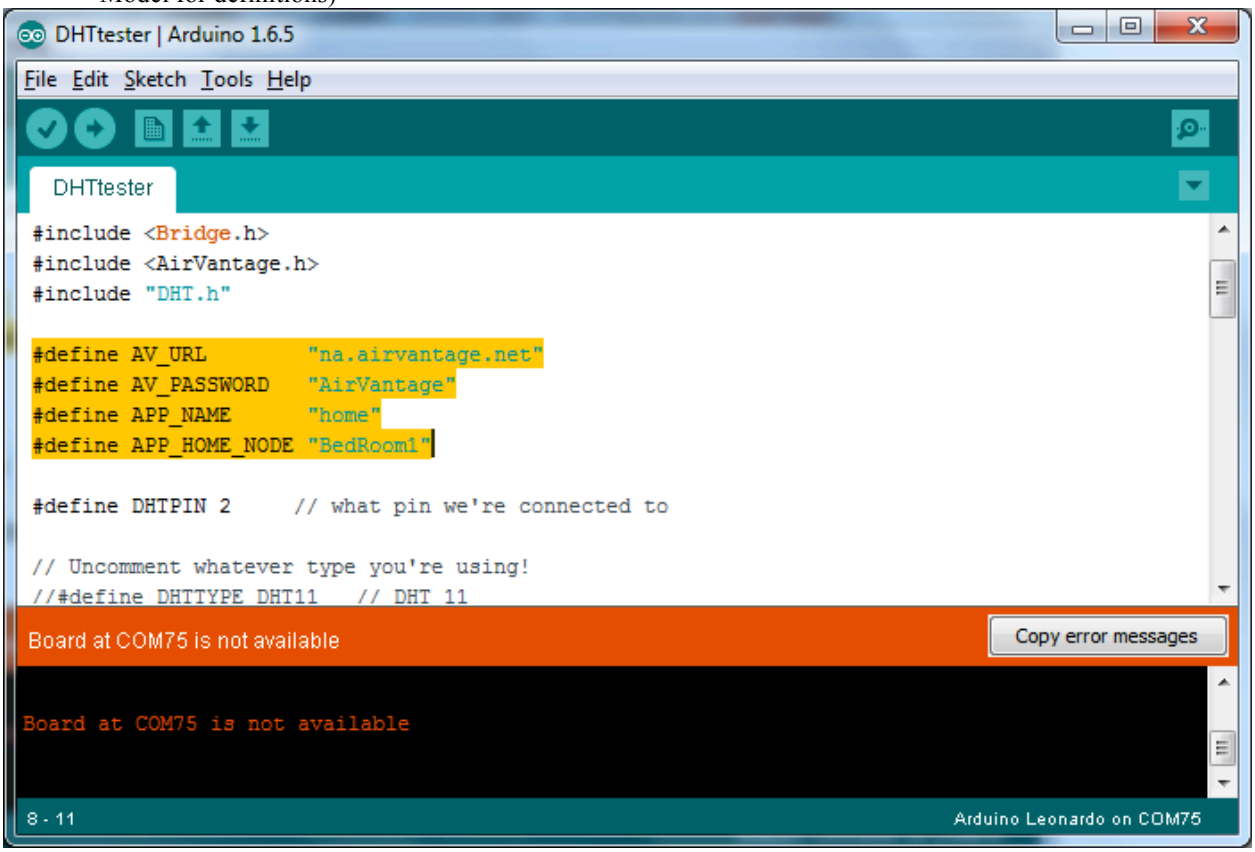
3.2 Update Sketch for AirVantage Arduino Yun Bridge

The following steps are required to update the sketch to use the AirVantage Arduino Yun Bridge:

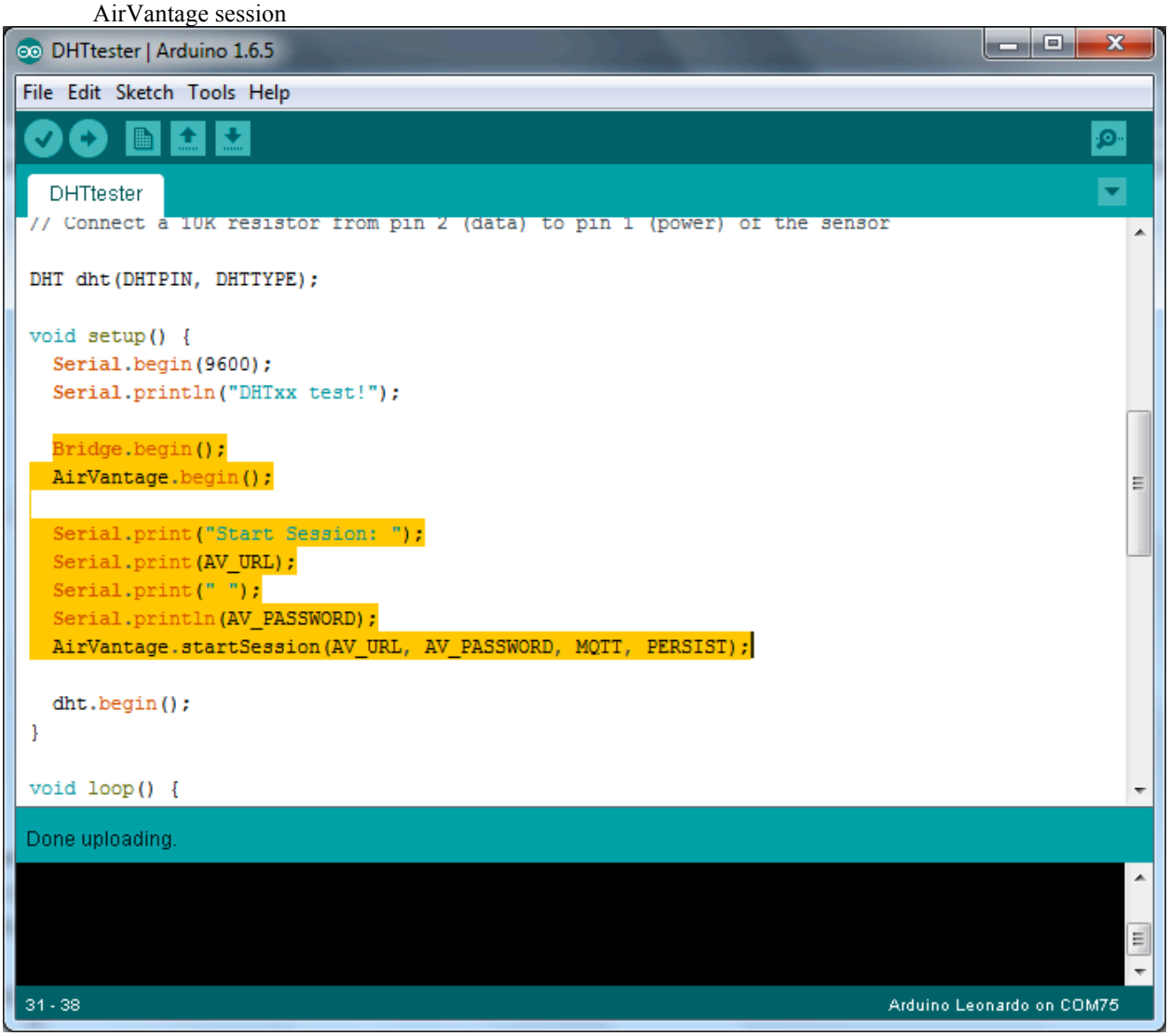
- Download the AirVantage.zip file containing the Arduino Yun Bridge AirVantage protocol extension library
- Add the library to the DHTester sketch using the Sketch | Include Library | Add .ZIP Library menu
- Modify the sketch to include the AirVantage bridge libraries



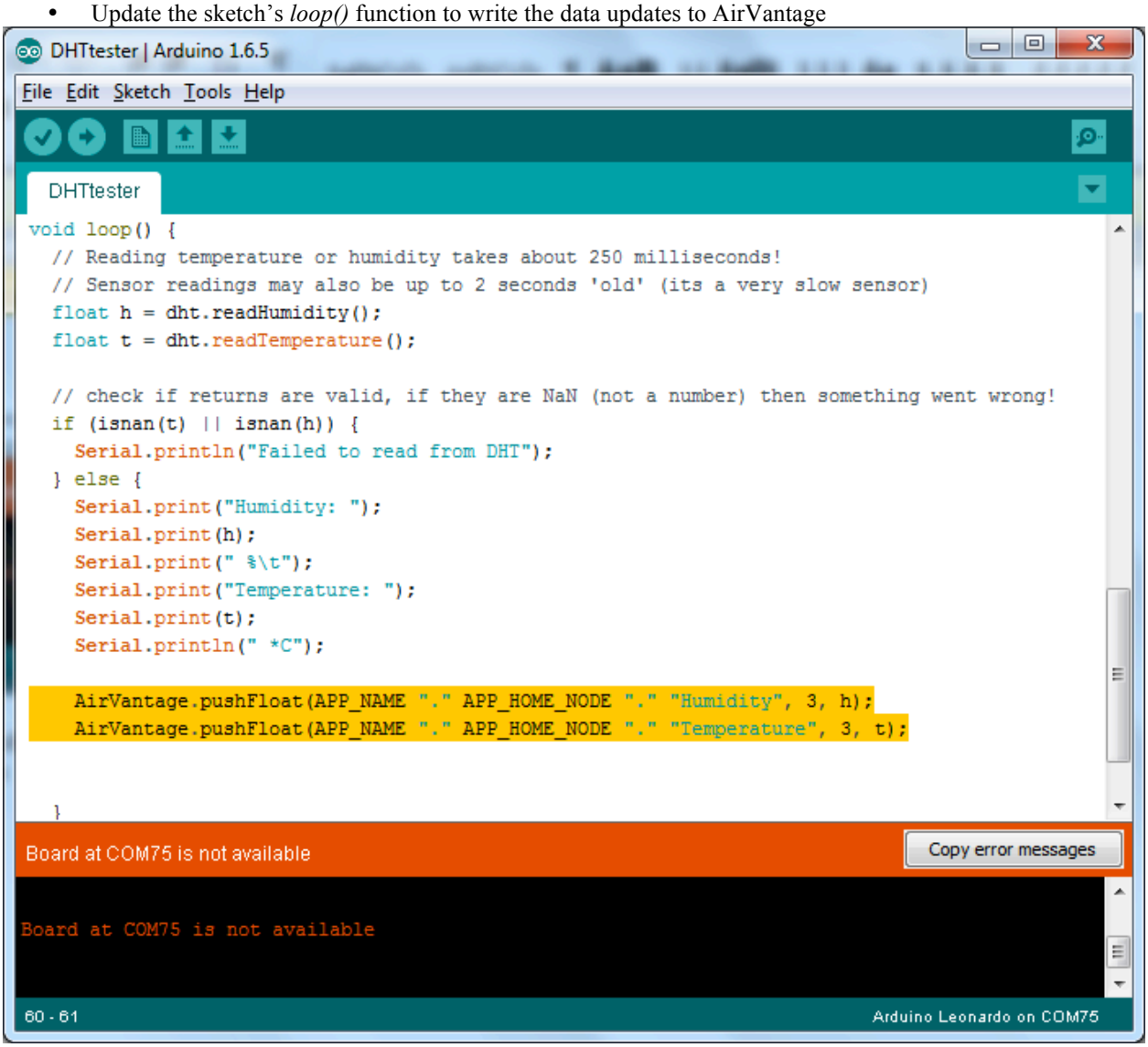
- Add the AirVantage URL and password as well as the AirVantage field name prefixes (see the Application Model for definitions)



- Update the sketch's *setup()* function to open and initialize the Arduino Yun Bridge and start a new AirVantage session



- Update the sketch's *loop()* function to write the data updates to AirVantage

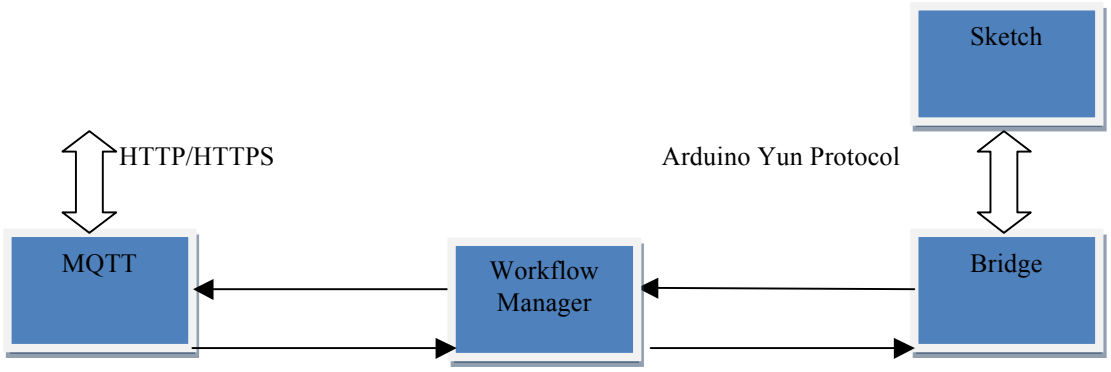


4 Legato Software

In order for the Arduino sketch to communicate with the WP the following three Legato applications are required to be installed and running:

- Arduino Yun Bridge
- Workflow Manager
- MQTT

The diagram below shows the data flows between AirVantage, MQTT/Workflow Manager/Bridge Legato applications and the Arduino sketch:



4.1 MQTT

The MQTT application provides an interface for applications to push data to AirVantage. Do the following to install and run the MQTT:

- Download the mqttClient.wp85 file to a Linux workstation with the Legato toolset already installed.
- Install the MQTT application using the *instapp* Legato command
- The MQTT is configured to auto-start so the application will start automatically after the application is downloaded

4.2 Workflow Manager

The Workflow Manager application is a Legato application that performs the following operations:

- Acts as a central database for all data values
- Receives published data updates and stores the values in its database
- Updates data subscribers when data values are update
- Routes published data updates to AirVantage (if configured to do so)

Do the following to install and run the Workflow Manager:

- Download the SwiMangohWorkflowMgr.wp85 file to a Linux workstation with the Legato toolset already installed.
- Install the SwiMangohWorkflowMgr application using the *instapp* Legato command
- The SwiMangohWorkflowMgr is configured to auto-start so the application will start automatically after the application is downloaded

4.3 Arduino Yun Bridge

The Arduino Yun Bridge application is a Legato application which executes the slave side of the Arduino Yun Bridge protocol. The Arduino Yun Bridge supports all of the existing protocol extensions (File I/O, Console, Mailbox, Process, Socket). In addition the Arduino Yun Bridge supports the AirVantage Arduino Yun extension developed for the MangOH project. Do the following to install and run the Arduino Yun Bridge:

- Download the SwiMangohBridge.wp85 file to a Linux workstation with the Legato toolset already installed.

- Install the SwiMangohBridge application using the *instapp* Legato command
- The SwiMangohBridge is configured to auto-start so the application will start automatically after the application is downloaded

5 AirVantage

The following sections show how view that Arduino sketch data updates and how to create an install Application Models which are required in order to send data updates to the Arduino sketch from AirVantage.

5.1 Create and Install an Application Model

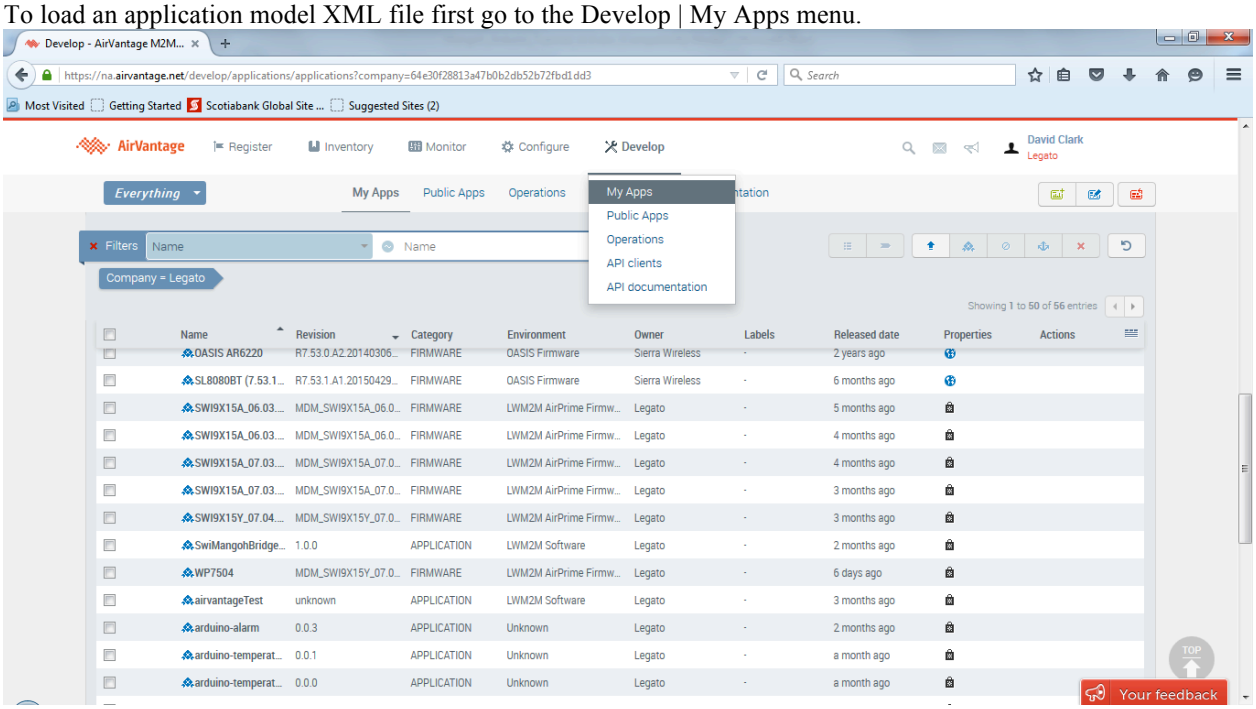
An application Model is required to create Custom Commands to write data from AirVantage to the sketch. The Application Model used for this tutorial was called 'arduino-alarm'. Application Models are created from XML files. The following XML file was used to create the 'arduino-alarm' Application Model:

```
<?xml version="1.0" encoding="UTF-8"?>

<app:application xmlns:app="http://www.sierrawireless.com/airvantage/application/1.0"
type="com.demo" name="arduino-alarm" revision="0.0.3">
      <capabilities>

        <communication>
          <protocol comm-id="IMEI" type="MQTT"/>
        </communication>

        <data>
          <encoding type="MQTT">
            <asset default-label="My Home" id="home">
              <setting default-label="Motion Detected" path="motion" type="int"/>
              <command path="TurnOn" default-label="Turn on">
                          <parameter id="Alarm" default-label="Alarm" type="boolean"/>
                       </command>
              <command path="BedRoom1" default-label="Bed Room 1">
                <parameter id="Light" default-label="Light" type="boolean"/>
                <parameter id="AirConditioner" default-label="Air Conditioner" type="int"/>
                <parameter id="Shutters" default-label="Shutters" type="boolean"/>
              </command>
            </asset>
          </encoding>
        </data>

      </capabilities>
</app:application>
```

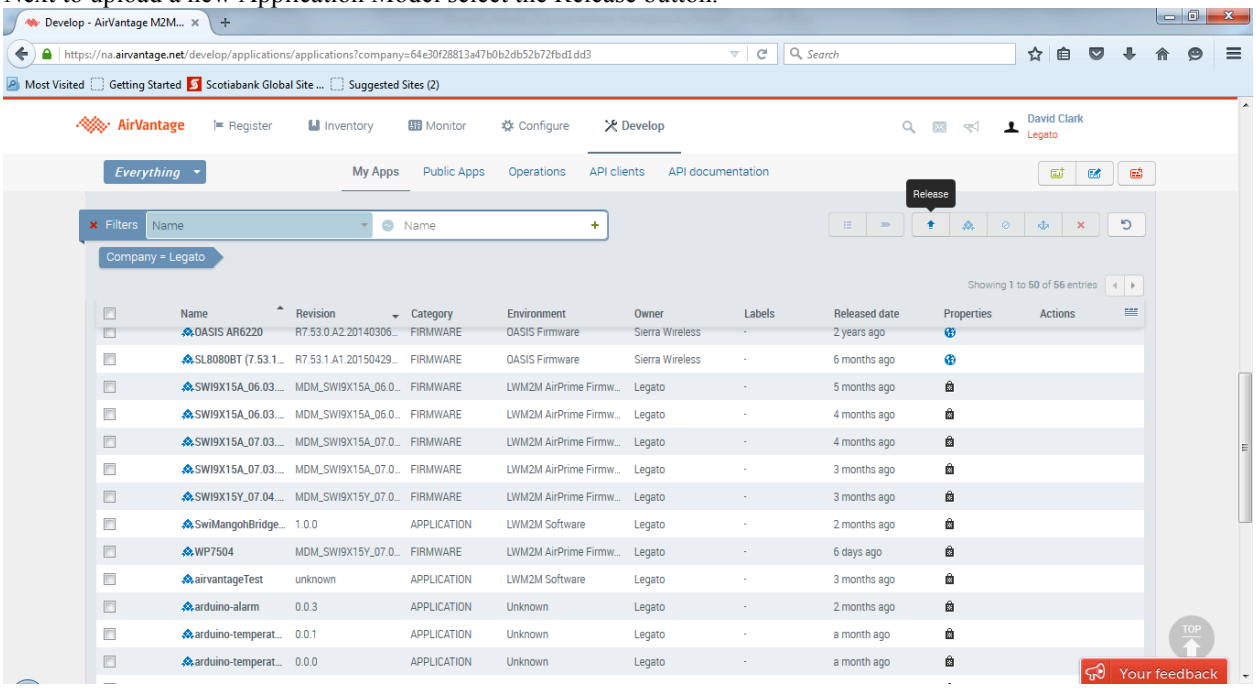
Note that highlighted in **RED** are the application name and application node name fields defined in the sketch. The field names for the parameters found in this application model will be as follows:

- Home.BedRoom1.Light
- Home.BedRoom1.Shutters
- Home.BedRoom1.AirConditioner

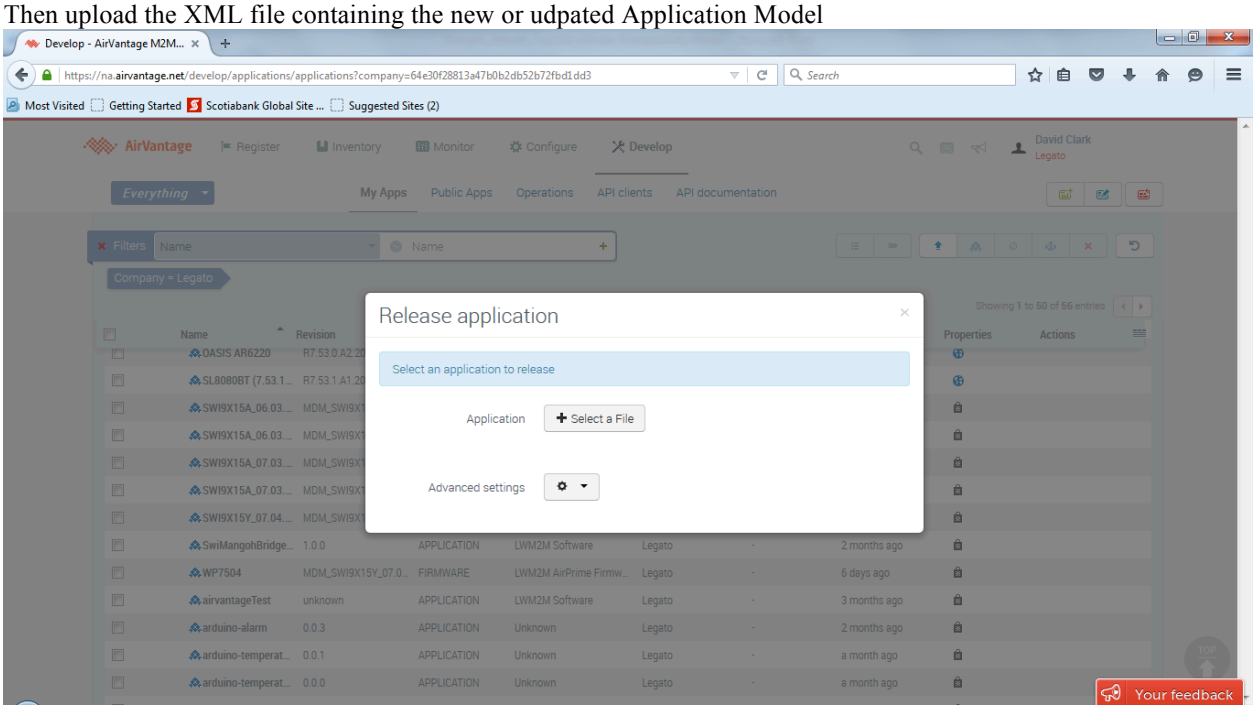
To load an application model XML file first go to the Develop | My Apps menu.



Next to upload a new Application Model select the Release button.



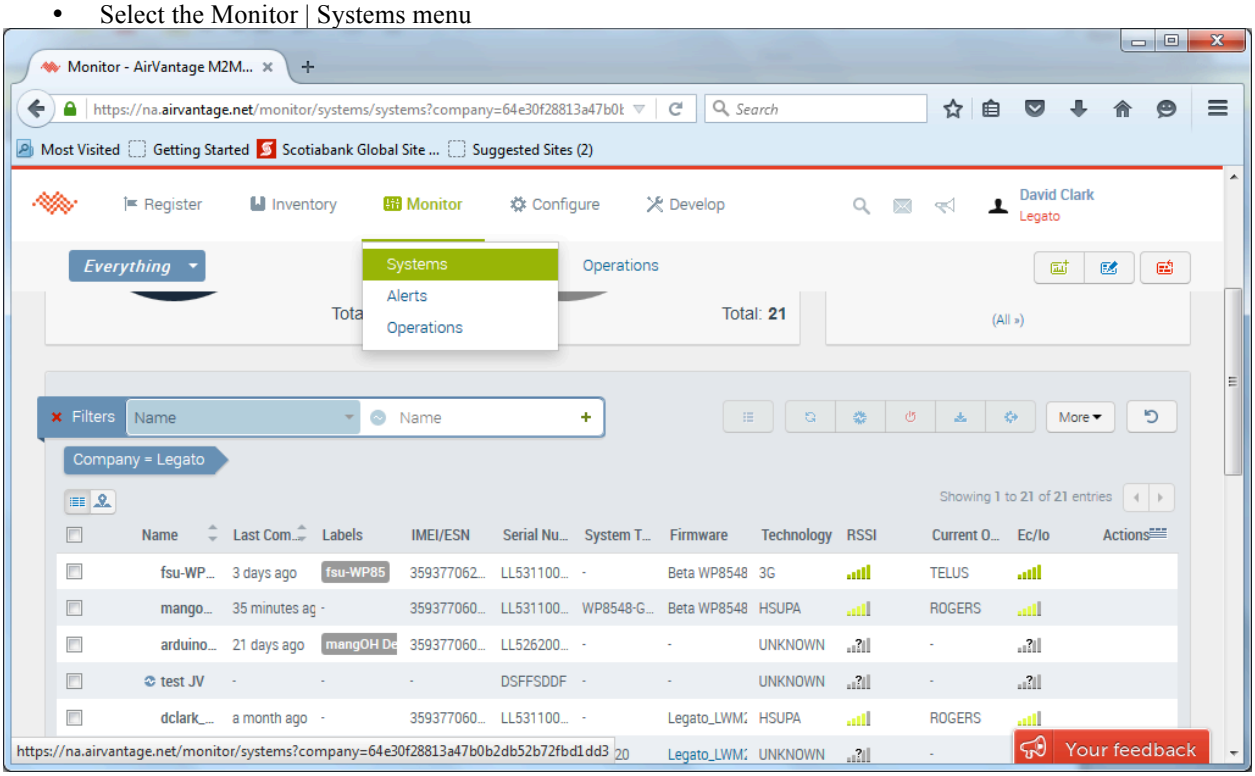
Then upload the XML file containing the new or udpated Application Model



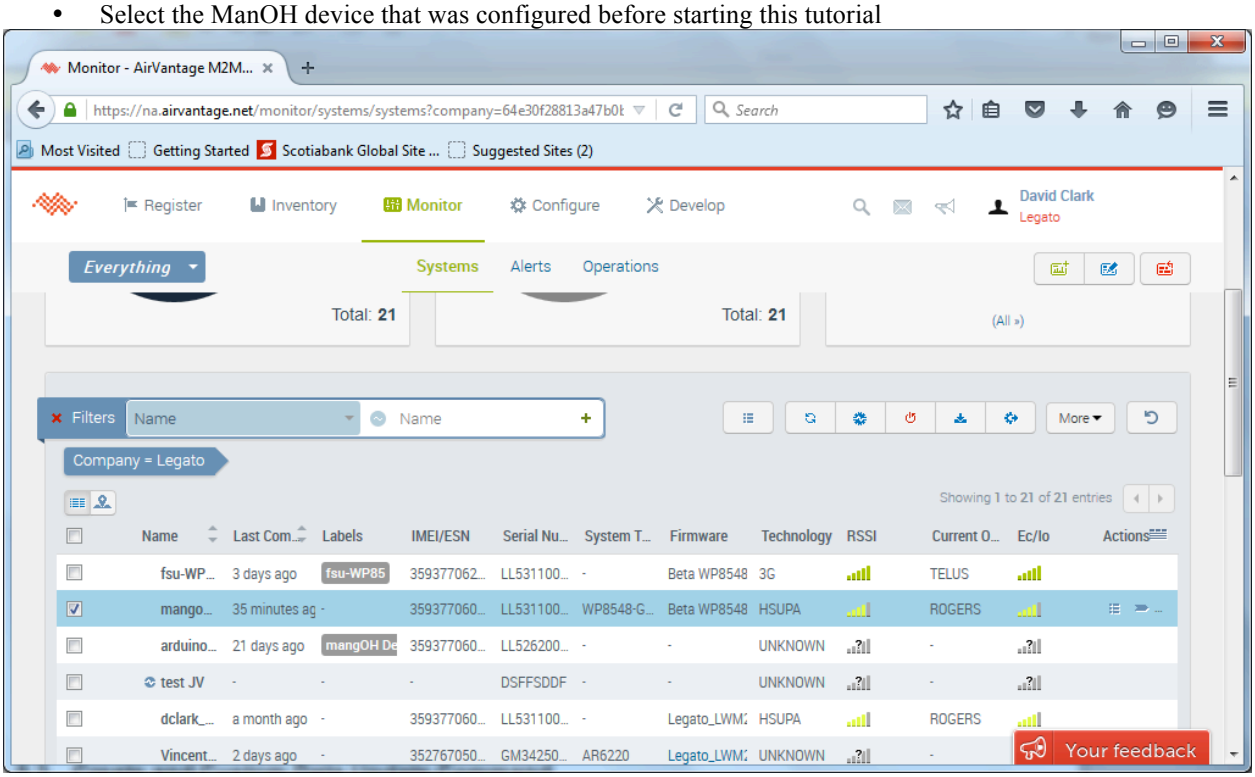
5.2 View Arduino Sketch Data on Device Timeline

To view data updates from the sketch on AirVantage do the following steps:

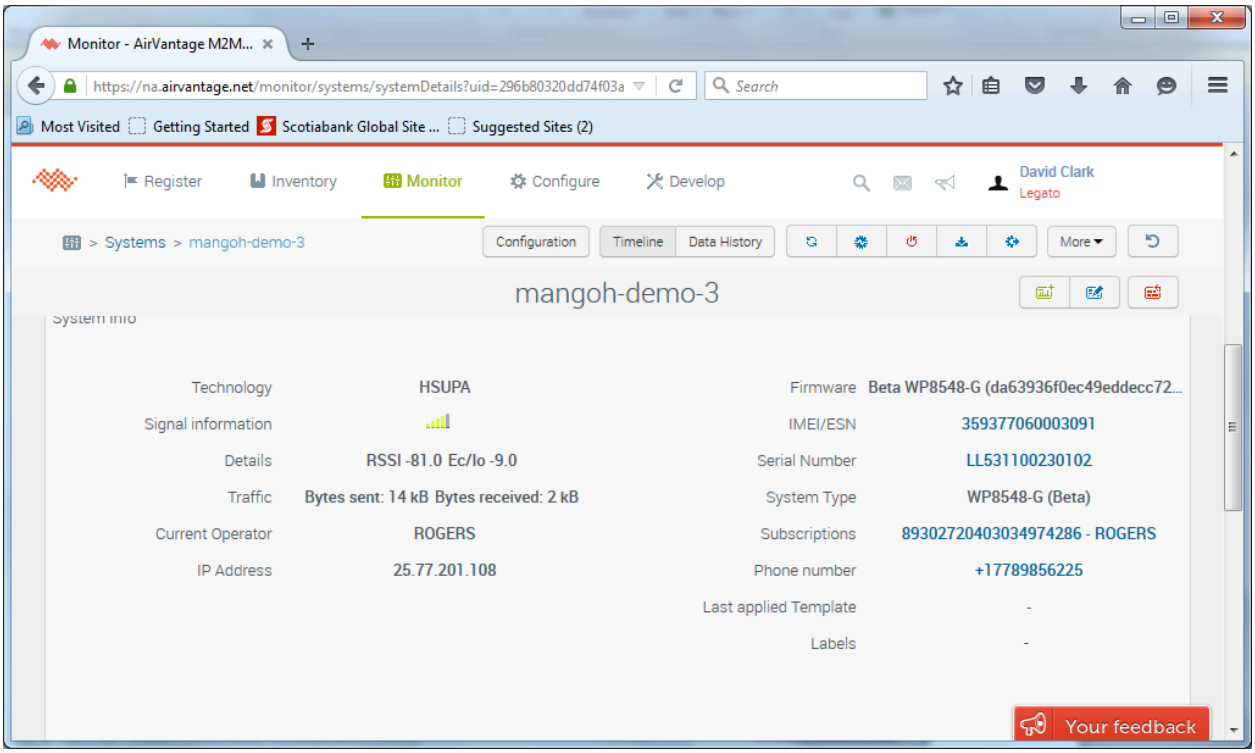
- Login to AirVantage
- Select the Monitor | Systems menu



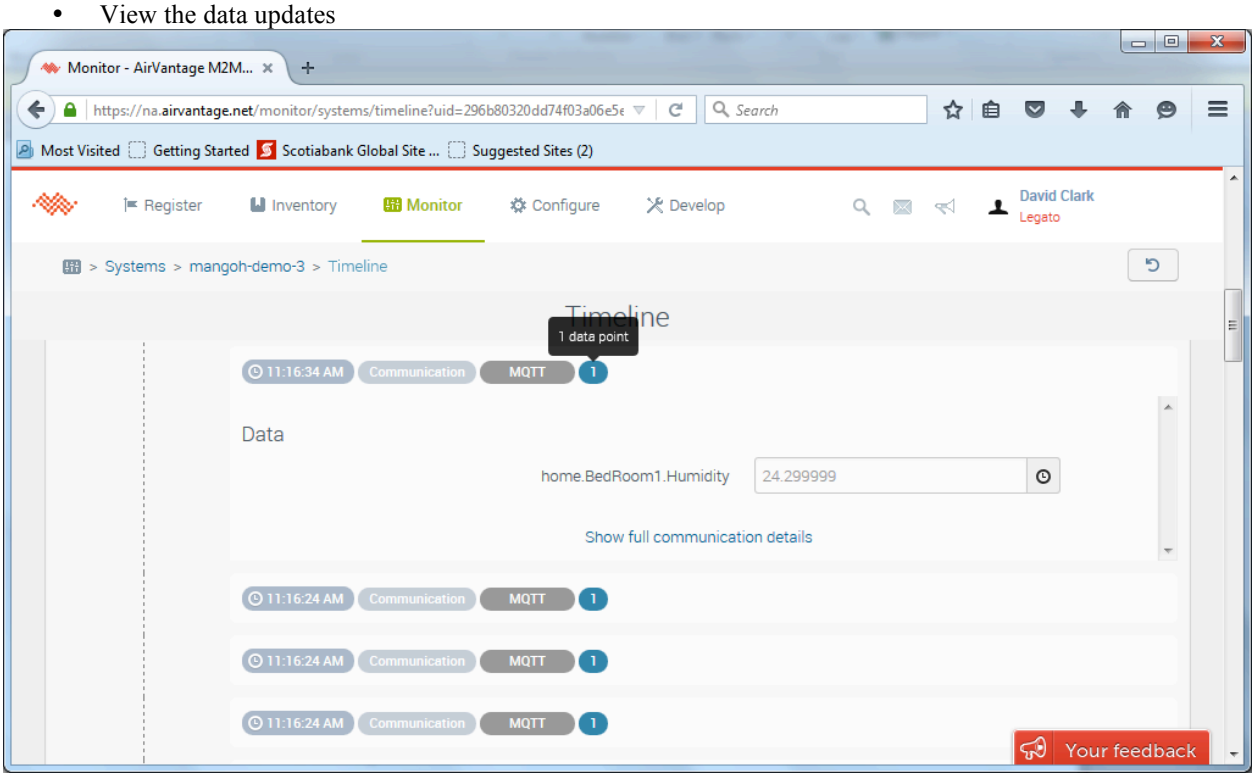
- Select the ManOH device that was configured before starting this tutorial



- View the Timeline for the device



- View the data updates



5.3 Write Data to Arduino Sketch from AirVantage

AirVantage Custom Commands are used to write data to Arduino sketches. Note that sketches must call the Arduino Yun AirVantage *available()* and *read()* commands to retrieve the updates from the Arduino Yun Bridge Legato application.

5.3.1 Updated Arduino Sketch for Reading AirVantage Data Updates

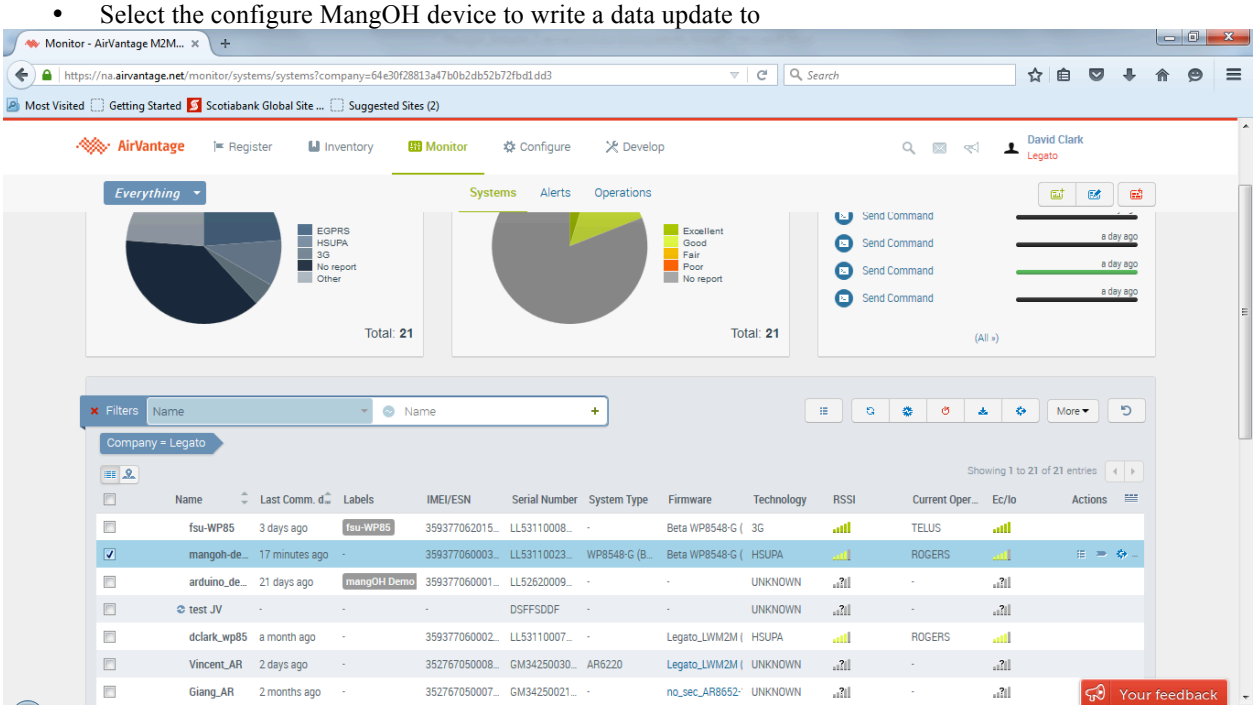
The screen capture below shows an updated DHTester Arduino sketch that will check for and read data updates and dump the data update to the Arduino console.

5.3.2 Create and Send Custom Data Update Command

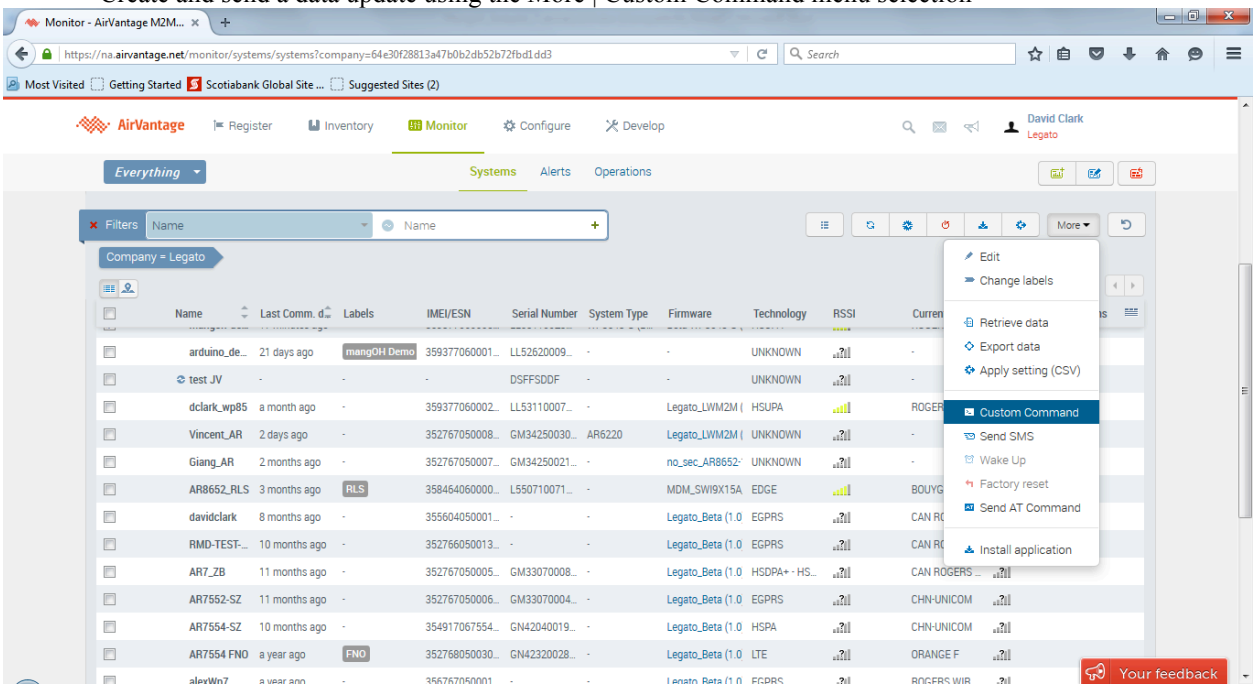
To create and send data updates from AirVantage to the Arduino sketch execute the following steps:

- Select the Monitor | Systems menu to view the list of configure devices.

- Select the configure MangOH device to write a data update to



- Create and send a data update using the More | Custom Command menu selection



- Configure the following Custom Command parameters and then select the Send Command button:
  - Application Model
  - Command
  - Data values