

An aerial photograph showing several people riding bicycles on a paved surface with a distinct diamond-shaped grid pattern. The perspective is from above, looking down at the riders.

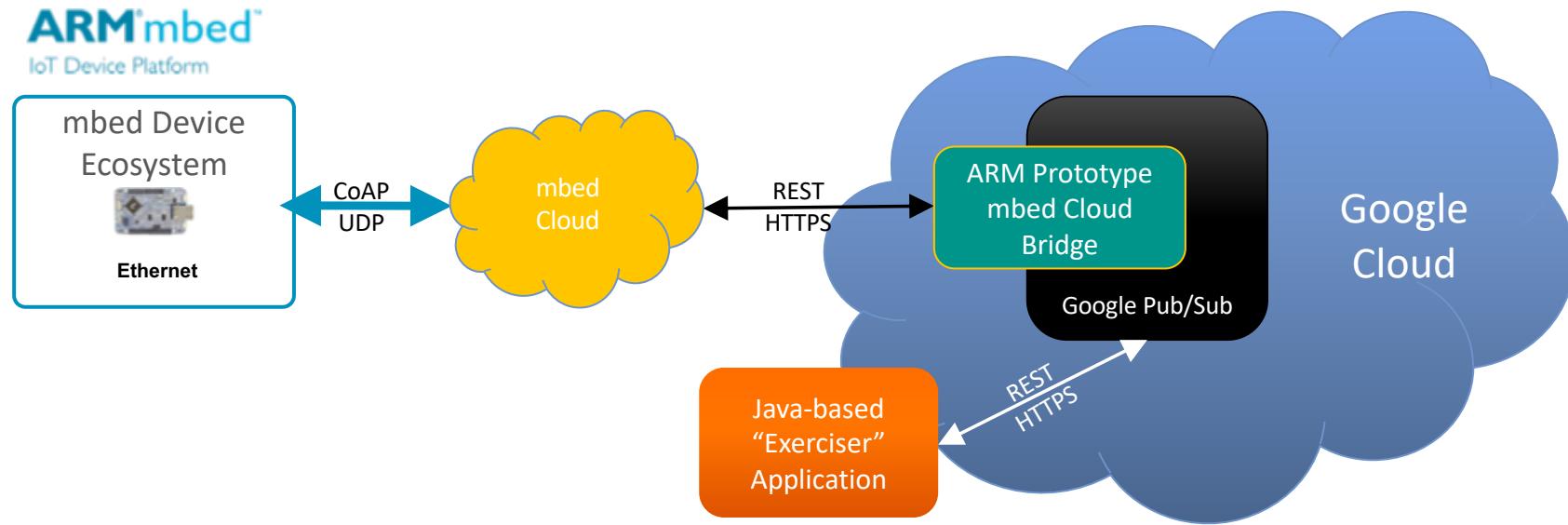
arm

Workshop

Connecting IoT devices to the cloud Google & mbed Cloud

Doug Anson
v2.2
February 2018

What will we build in this Workshop?



- Connect your mbed device into Google Cloud through mbed Cloud and ARMs Prototype Google Cloud Bridge
 - Create a simple mbed device and connect it to mbed Cloud
 - Create an instance of ARM's Prototype Google Cloud bridge and bind it to your Google and mbed Cloud accounts
 - Exploration of the device data telemetry using a java-based “exerciser” application utilizing Google’s Pub/Sub APIs

Workshop: Let's get started!

Create and setup your Google account (should be completed prior to workshop)

Install the necessary tools/drivers PC/Mac/Linux (should be completed prior to workshop)

Create mbed developer and mbed Cloud accounts (should be completed prior to workshop)

Retrieve a set of provisioning credentials (mbed_cloud_dev_credentials.c)

Import our mbed sample project into the online IDE

Update the sample project with the provisioning credentials (mbed_cloud_dev_credentials.c)

Compile, Install, Download, and Copy into the mbed device

Connect a Serial Terminal (115200,8N1, proper mbed COM port chosen for Windows users...)

Send the “Break” command to reset the mbed device

See the device output on our Serial Terminal (PTSOI method...)

NOTE: During the workshop, be sure to double-check your copy/paste operations...

Quick Links: Visit https://github.com/ARMmbed/bridge_workshop_google_cloud

- README.md has all of the links in the workshop + this presentation in PDF format

Create our Google Cloud Account

Navigate to the Google Console:

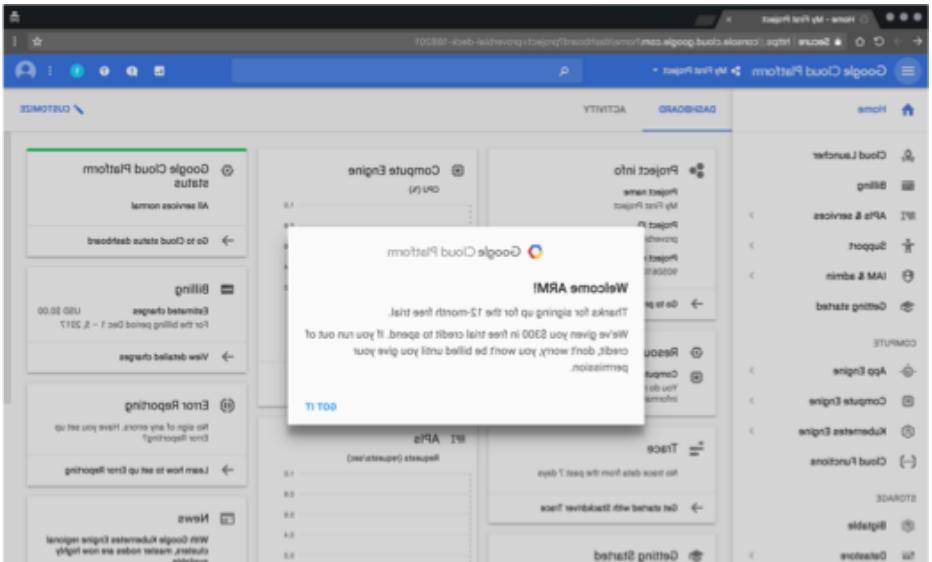
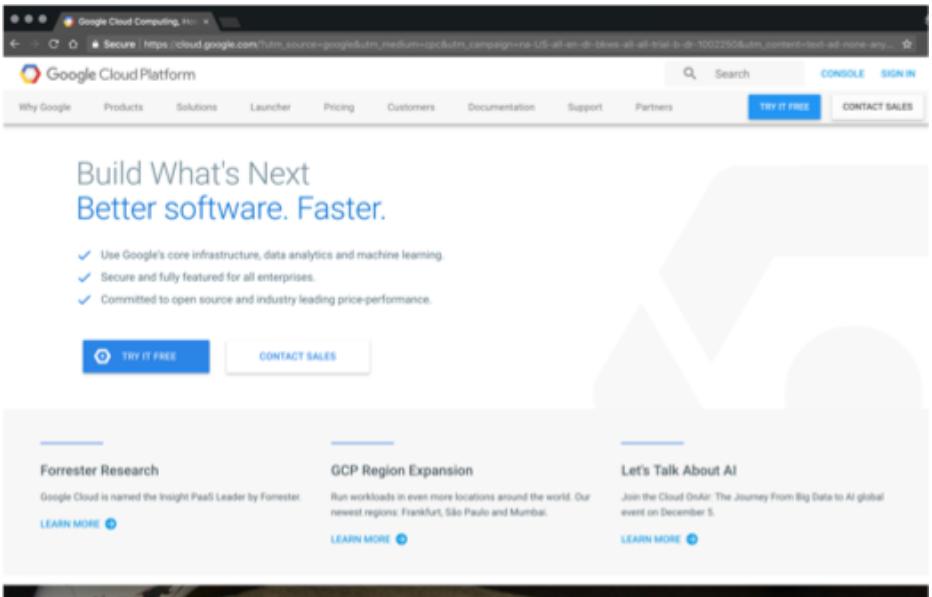
<https://cloud.google.com>

Press "Try It Free"

Complete the signup process (you'll need to supply a credit card – but the trial is for 1 year)

You'll then be at the main dashboard

Prior to Workshop



NXP- FRDM-K64F Overview

Freedom Development Platform - Quick, simple development experience with rich features

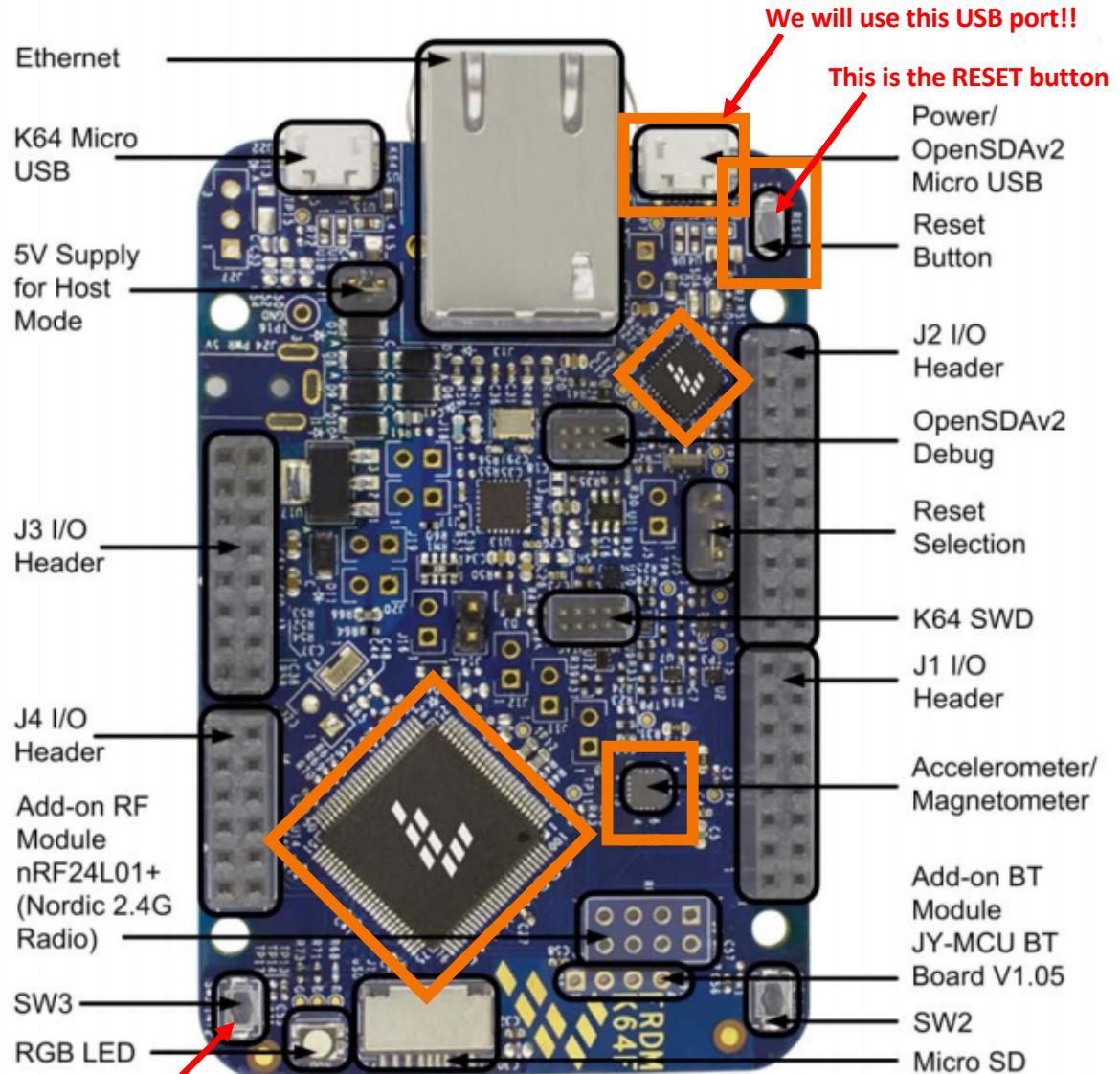
- Cortex-M4, 120MHz, 1MB Flash, 256KB SRAM
- Easy access to MCU I/O
- 3-axis **accelerometer**/3-axis **magnetometer**
- RGB LED
- Add-on **Bluetooth** Module
- Built-in Ethernet/Add-on **Wireless** Module
- Micro SD

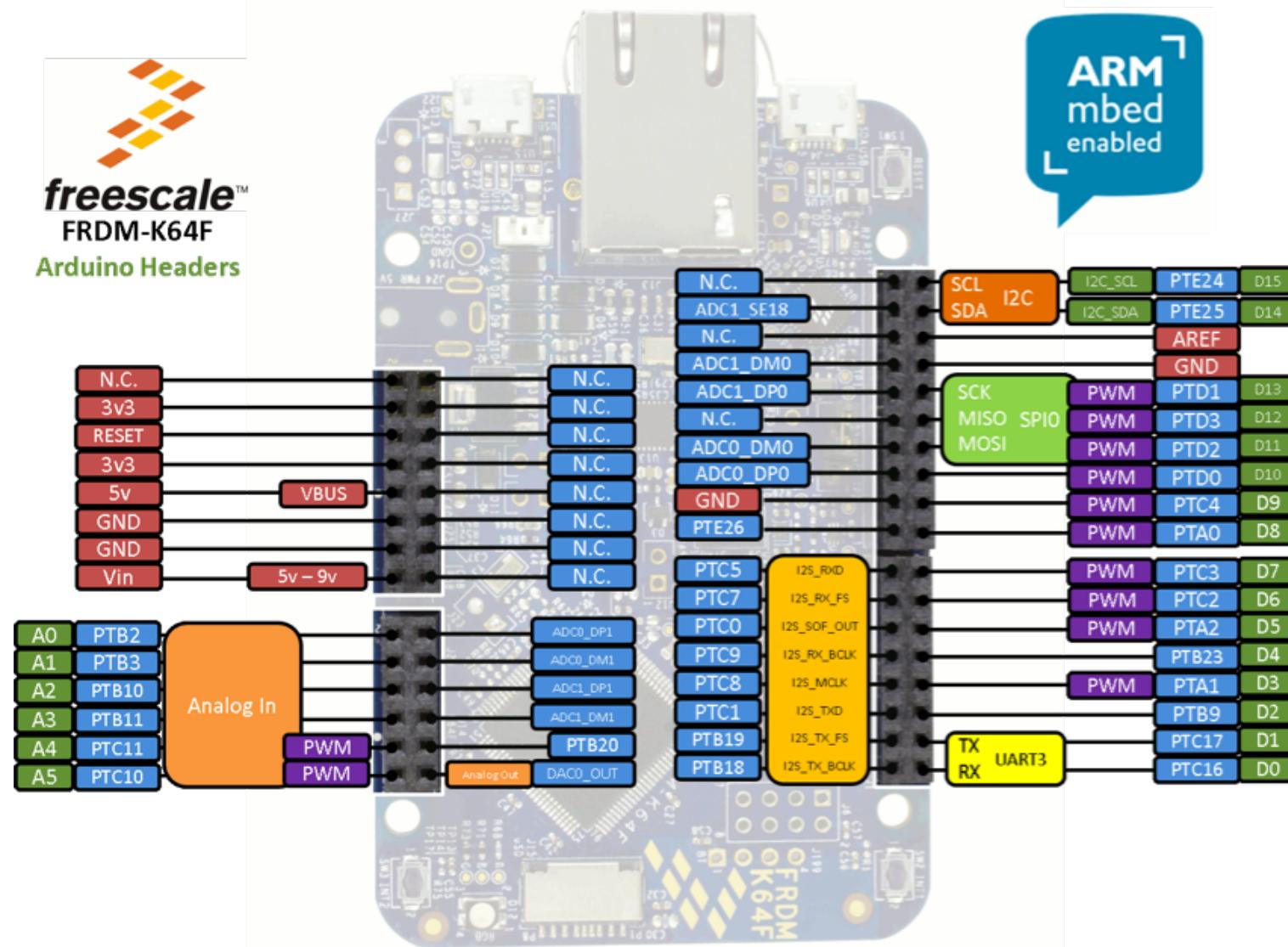
Arduino shield compatible

Flash programming functionality

Enabled by OpenSDA debug interface

De-Registration Button!
(SW3)





Install the Necessary Tools

- **Windows IMPORTANT:** Install the mbed USB Serial driver -
https://developer.mbed.org/media/downloads/drivers/mbedWinSerial_16466.exe
 - Insert the USB cable and mbed device BEFORE running the Serial Driver installation...
 - the installer MUST see the device *first*
 - *You will need administrator access to your Windows PC to install this driver*
- Serial Terminal: Putty - <http://www.putty.org/>
- Chrome and Firefox Browsers may also be used
- Docker *Toolbox* installed on your Windows PC: <https://github.com/docker/toolbox/releases/tag/v1.12.2>
- Docker Engine installed on your Mac - <https://docs.docker.com/engine/installation/mac/> (*not* Toolbox)
- Docker Engine installed on your Linux - <https://docs.docker.com/engine/installation/linux/>
- Mac/Linux: install "git" (mac: <https://git-scm.com/download/mac>, Ubuntu: use "apt-get install git")
- Mac Serial Terminal - http://freeware.the-meiers.org/CoolTerm_Mac.zip
- Linux Serial Terminal - http://freeware.the-meiers.org/CoolTerm_Linux.zip

Connect both your USB cable and Ethernet cable to the K64F and leave it there for now

Prior to
Workshop

Create Your mbed Account

Navigate to: <https://os.mbed.com/>

Prior to
Workshop

Create an Account

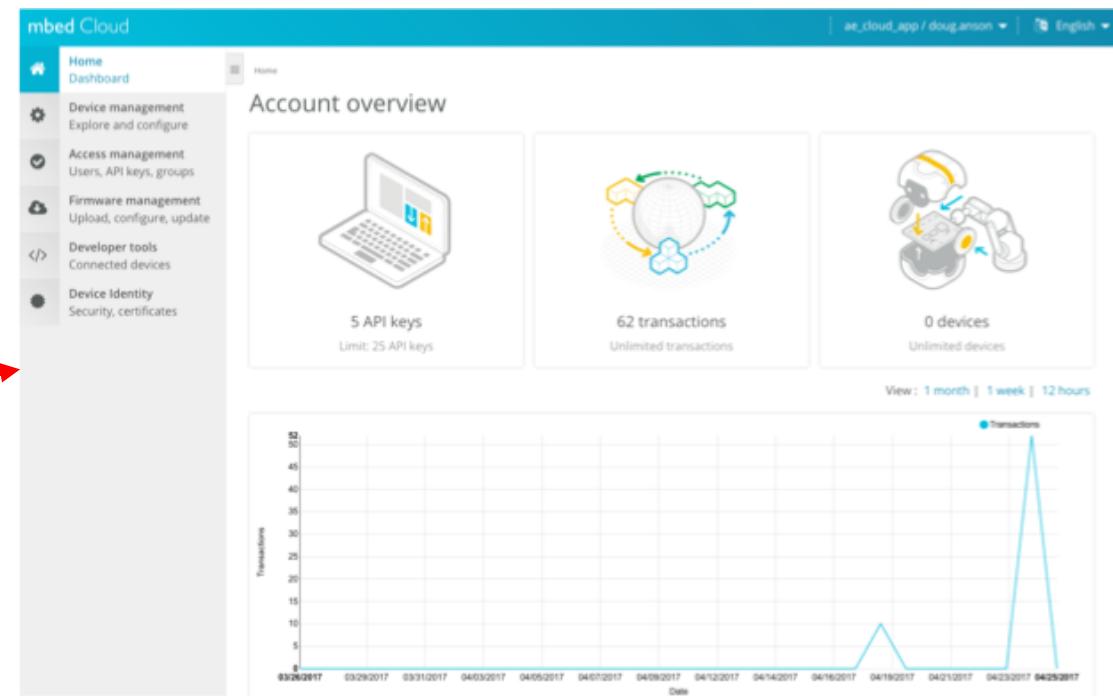
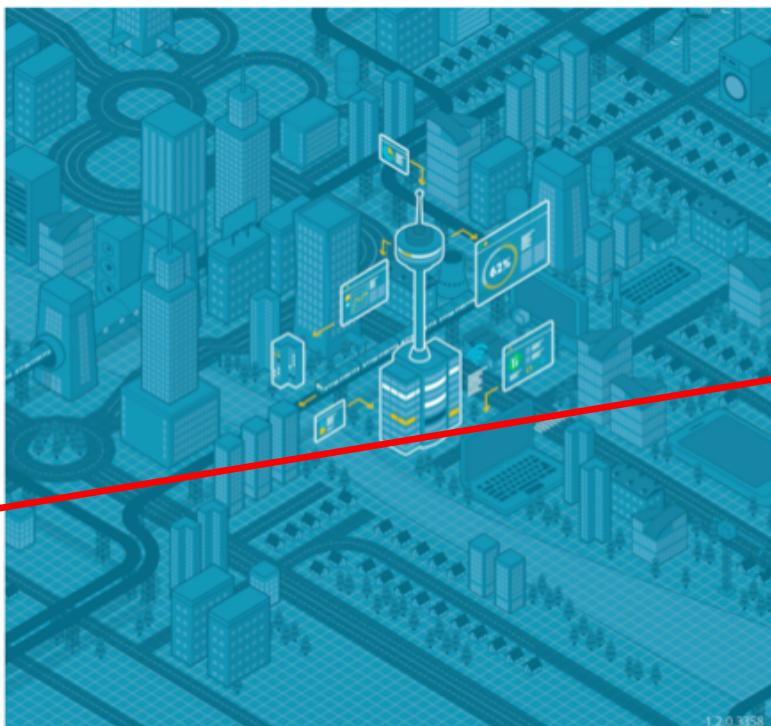
The screenshot shows the ARM mbed developer website's login and signup interface. At the top, there is a navigation bar with links to Platforms, Components, Handbook, Cookbook, Code, Questions, and Forum. On the right side of the header, there are 'Dashboard' and 'Compiler' buttons, and a green 'Login or signup' button. The main content area features the 'ARM mbed™' logo. On the left, there is a 'Login' form with fields for 'Username' and 'Password', and links for 'I've forgotten my username?' and 'I've forgotten my password?'. There is also a 'Remember me' checkbox and a 'Login' button. On the right, there is a 'Signup' form with a large blue 'mbed' logo and a 'Signup' button. At the bottom of the page, there is a footer with links to blog, we're hiring!, support, service status, privacy policy, terms and conditions, and language selection (en ja es de).

Create Your mbed Cloud Account...

Navigate to the mbed Cloud Dashboard:
<https://portal.mbedcloud.com>

Confirm that you can log into your mbed device mbed Cloud dashboard

Prior to
Workshop



Log into the Online IDE – Add the K64F Compile Target

Go to <https://developer.mbed.org>

Select the “Compiler” page

Click on “No device selected”

Click on “Add Device”

Check “mbed Enabled”

Click on the “FRDM-K64F”

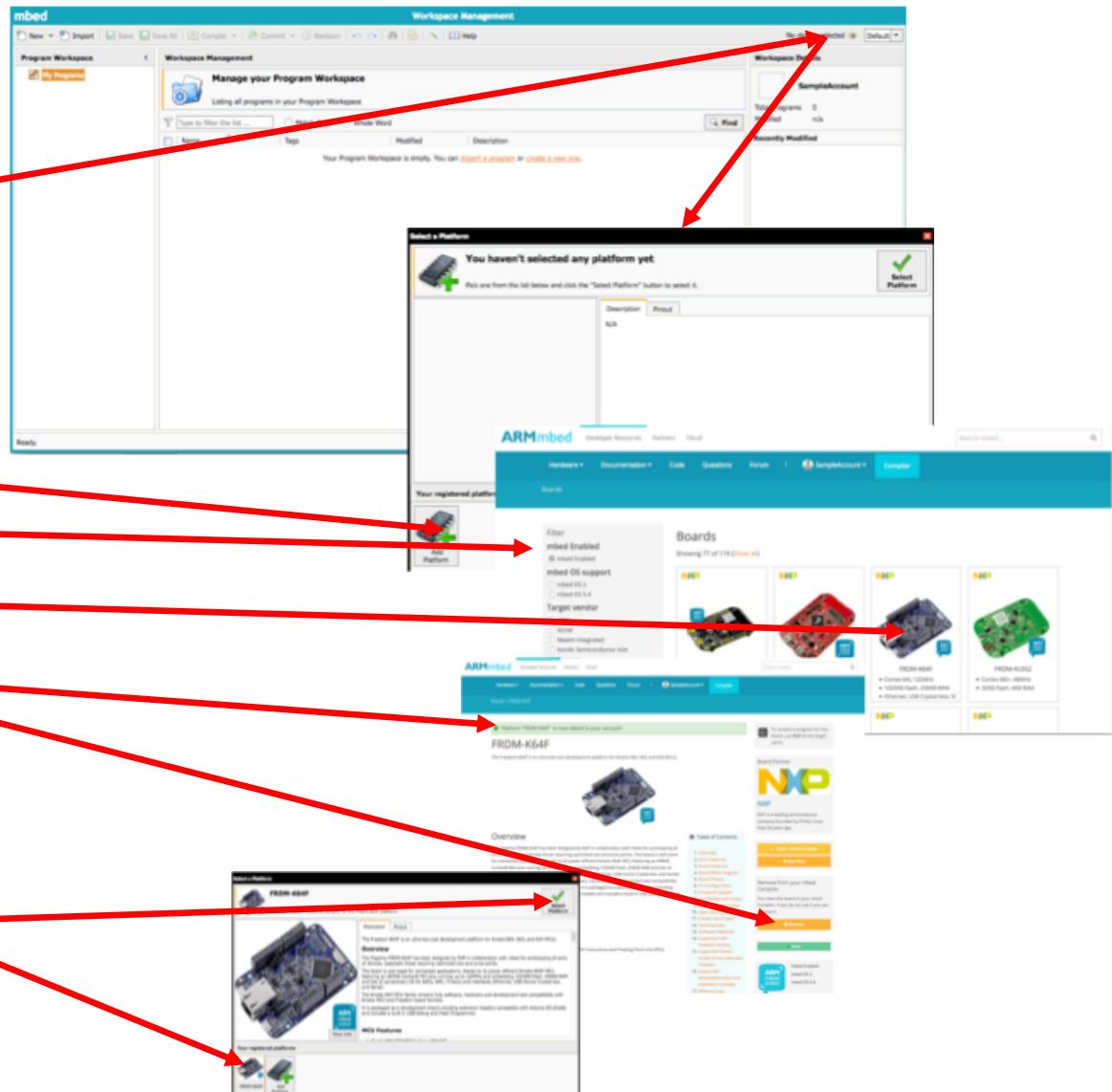
Click on “Add to Compiler”... note addition.

Dismiss all windows... go back to the compiler page

Click on “No device selected”

Now, select the “FRDM-K64F” to add and select

Dismiss and confirm on your compiler page



Import our K64F Endpoint Project

Go to <https://developer.mbed.org>

Select the “Compiler” page

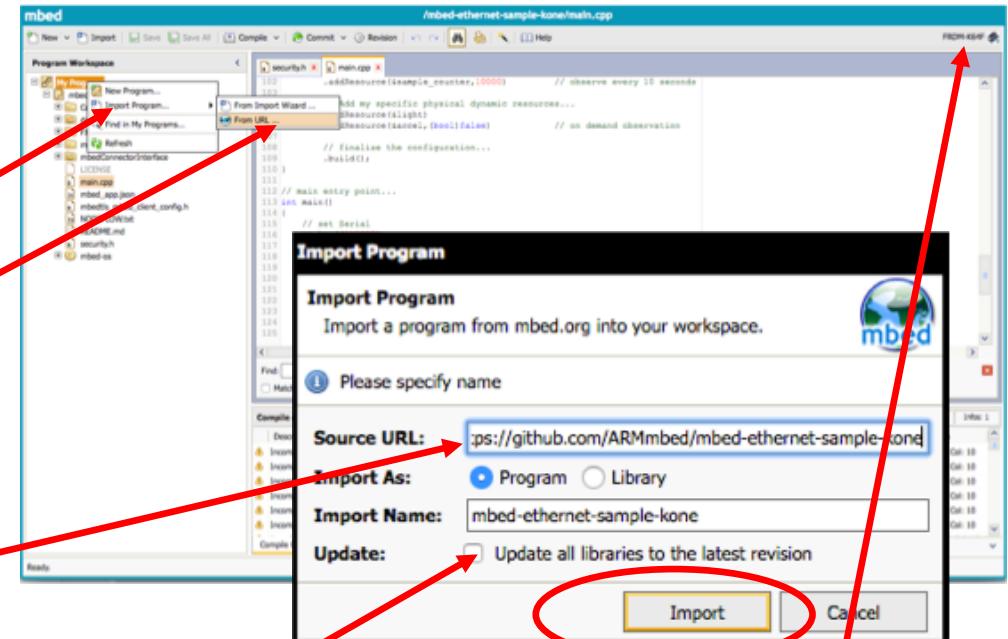
Right-click on “My Programs” → “Import Program”

Choose Select “from URL...”

Enter this URL (Leave the “Update all libraries...” **unchecked**)

<https://github.com/ARMmbed/mbed-cloud-sample/>

Press “Import”, the ensure that “FRDM-K64F” is selected



Set Provisioning Credentials in Your Endpoint Code

Go back to the mbed Device mbed Cloud dashboard: <https://portal.mbedcloud.com>

- In the left sidebar, select “Device Identity” → “Certificates”
- Under “Actions”, select “create a developer certificate”
- Give your developer certificate a name and description... press “create certificate”
- Press “Download Developer C file” – this will deposit “mbed_cloud_dev_credentials.c” in your downloads directory

Now, go back to the Compiler page of your online IDE

Replace mbed_cloud_dev_credentials.c with newly downloaded one from the dashboard

Save

- Glance at main.cpp... a clean and simple mbed endpoint example
- Exposes three CoAP resources: accelerometer , monotonic counter, and LED

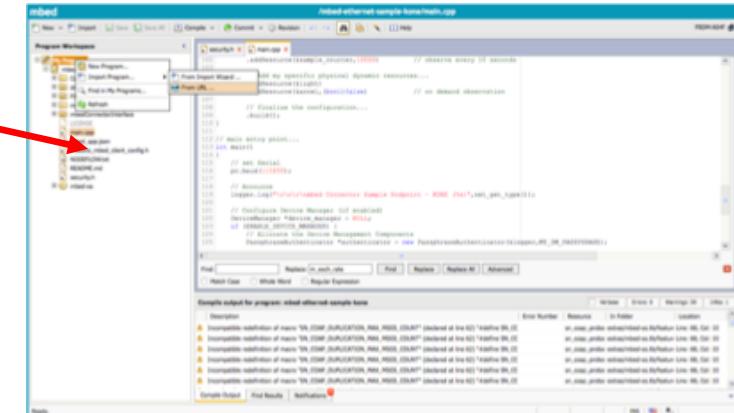
Select the project name and press the “Compile” button

The endpoint code should compile up successfully

The online IDE will deposit a “bin” file into your downloads directory

Drag-n-Drop this bin file to your “MBED” flash drive (may also be called “DAPLINK”)

K64F green LED will flicker for a bit, then stop, and dismount/remount...



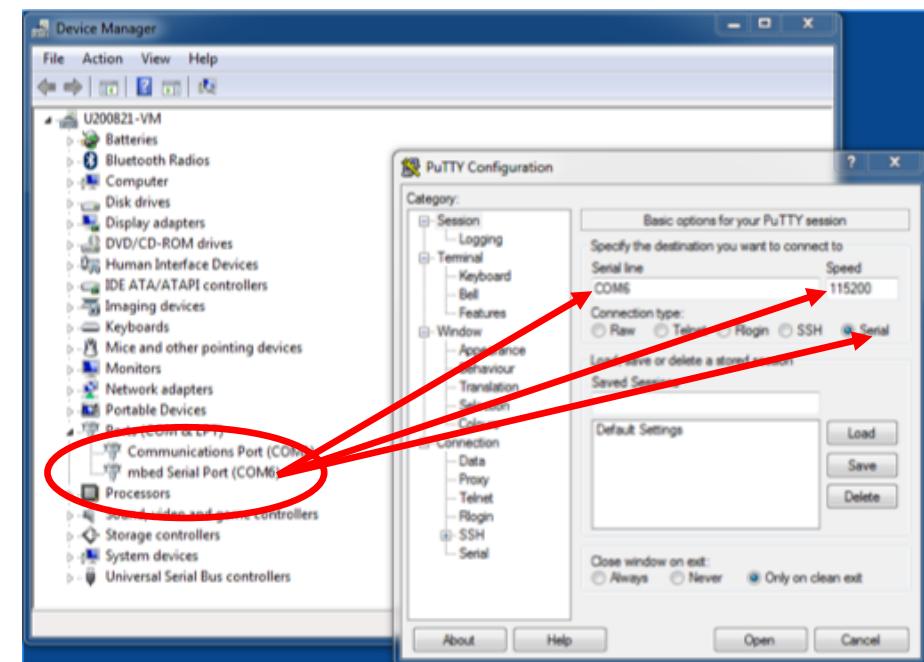
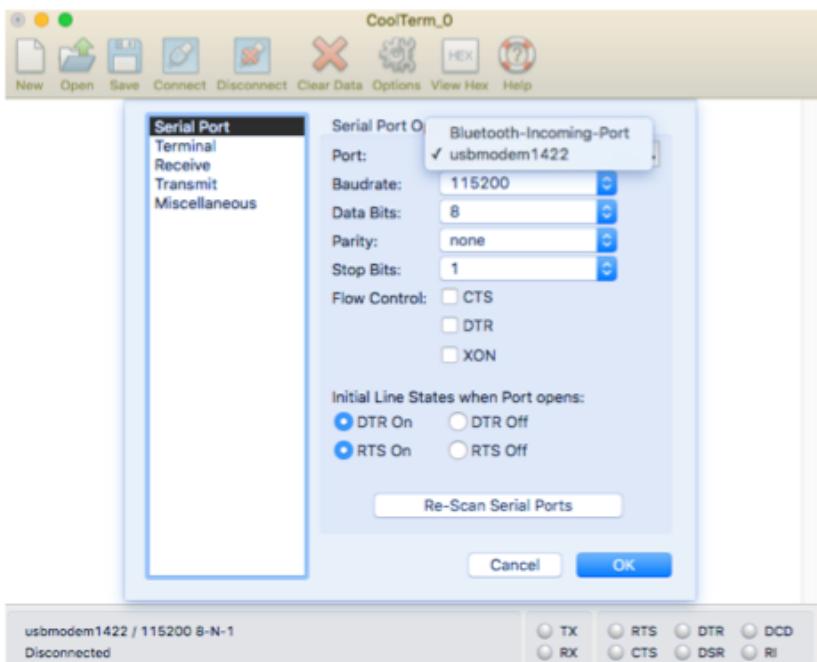
Running your Endpoint Code

Bring up your Serial Terminal

- CoolTerm for Windows, Mac, Linux: Select: “Options→”Re-scan serial ports”. Select the mbed one found.
 - For MAC, you may need to “authorize” the CoolTerm Application under your “System Preferences”->“Security & Privacy”... you may have to allow apps to run from “any developer”, then authorize the launch of CoolTerm.
- PuTTY for Windows : You must determine what COM port your mbed device is. Look in the Windows Device Manager FYI

For the endpoint serial configuration, set the baud rate to 115200 baud, defaults for everything else: (8, N, one)

- PuTTY for Windows: Ensure that you have “Serial” radio button selected...



Running your Endpoint Code...

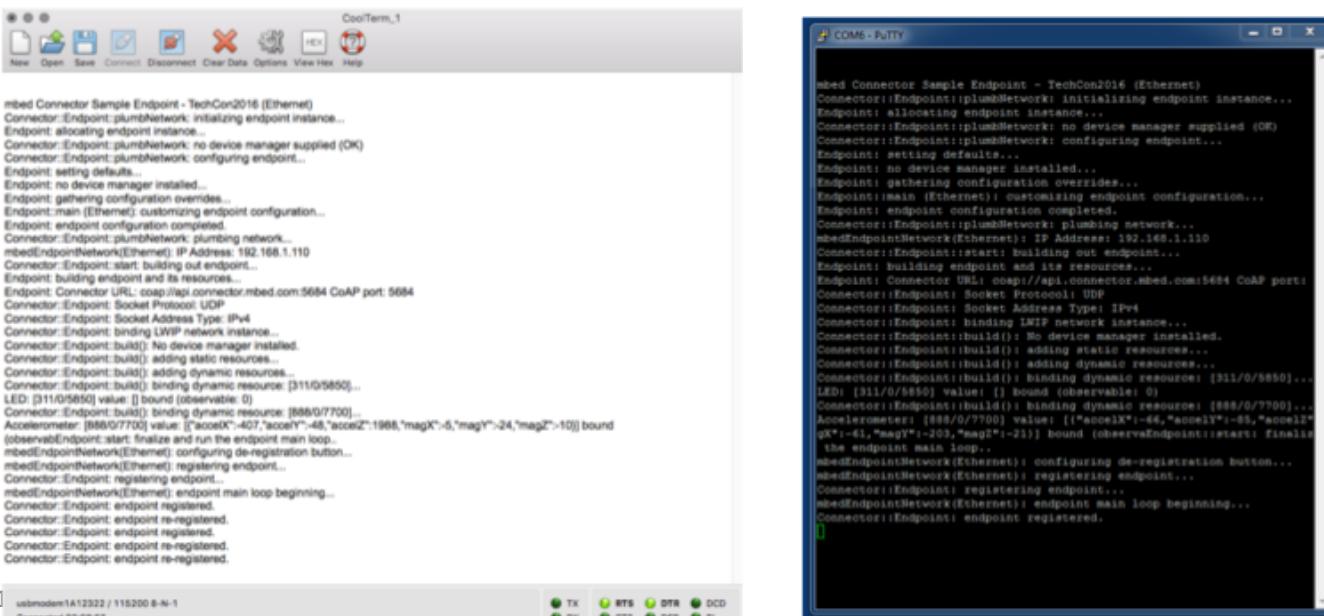
Connect your Serial Terminal to the K64F:

- CoolTerm for Windows, Mac, Linux: Simply press the “Connect” button on the top part of the CoolTerm GUI
- PuTTY for Windows: Press the “Open” button

Send a “Break” command from the serial terminal (or press the RESET button on the K64F)

- CoolTerm for Windows, Mac, Linux: “Connection” → “Send Break”
- PuTTY for Windows: Right-click on top of Window, Select “Special Command” → “Break”

Look at the output – you need to confirm that you see “endpoint registered” in the output:



The image displays two side-by-side terminal windows showing the output of the mbed Connector Sample Endpoint code running on a K64F. Both windows show the initial configuration steps, including the creation of an endpoint instance, the allocation of resources, and the configuration of the CoAP port (5684). The logs also show the binding of dynamic resources and the finalization of the endpoint main loop. In the PuTTY window, the message "Connector:Endpoint: endpoint registered." is clearly visible, indicating successful registration.

```
mbed Connector Sample Endpoint - TechCon2016 (Ethernet)
Connector:Endpoint:plumbNetwork: initializing endpoint instance...
Endpoint: allocating endpoint instance...
Connector:Endpoint:plumbNetwork: no device manager supplied (OK)
Connector:Endpoint:plumbNetwork: configuring endpoint...
Endpoint: setting defaults...
Endpoint: no device manager installed...
Endpoint: gathering configuration overrides...
Endpoint: Endpoint (Ethernet) customizing endpoint configuration...
Endpoint: endpoint configuration completed.
Connector:Endpoint:plumbNetwork: plumbing network...
mbedEndpointNetwork(Ethernet): IP Address: 192.168.1.110
Connector:Endpoint: start: building out endpoint...
Endpoint: building endpoint and its resources...
Endpoint: Connector URL: coap://api.connector.mbed.com:5684 CoAP port: 5684
Connector:Endpoint: Socket Protocol: UDP
Connector:Endpoint: Socket Address Type: IPv4
Connector:Endpoint: binding LWIP network instance...
Connector:Endpoint:build(): No device manager installed.
Connector:Endpoint:build(): adding static resources...
Connector:Endpoint:build(): adding dynamic resources...
Connector:Endpoint:build(): binding dynamic resource: [311/0/5850]...
LED: [311/0/5850] value: [] bound (observable: 0)
Connector:Endpoint:build(): binding dynamic resource: [888/0/7700]...
Accelerometer: [888/0/7700] value: [{"accelX": -407, "accelY": -1968, "magX": 5, "magY": -24, "magZ": 10}] bound
(observeEndpoint: start: finalize and run the endpoint main loop...
mbedEndpointNetwork(Ethernet): configuring de-registration button...
mbedEndpointNetwork(Ethernet): registering endpoint...
Connector:Endpoint: endpoint registered...
mbedEndpointNetwork(Ethernet): endpoint main loop beginning...
Connector:Endpoint: endpoint re-registered.
Connector:Endpoint: endpoint registered.
Connector:Endpoint: endpoint re-registered.
Connector:Endpoint: endpoint re-registered.

mbed Connector Sample Endpoint - TechCon2016 (Ethernet)
Connector:Endpoint:plumbNetwork: initializing endpoint instance...
Endpoint: allocating endpoint instance...
Connector:Endpoint:plumbNetwork: no device manager supplied (OK)
Connector:Endpoint:plumbNetwork: configuring endpoint...
Endpoint: setting defaults...
Endpoint: no device manager installed...
Endpoint: gathering configuration overrides...
Endpoint: Endpoint (Ethernet) customizing endpoint configuration...
Endpoint: endpoint configuration completed.
Connector:Endpoint:plumbNetwork: plumbing network...
mbedEndpointNetwork(Ethernet): IP Address: 192.168.1.110
Connector:Endpoint: start: building out endpoint...
Endpoint: building endpoint and its resources...
Endpoint: Connector URL: coap://api.connector.mbed.com:5684 CoAP port: 5684
Connector:Endpoint: Socket Protocol: UDP
Connector:Endpoint: Socket Address Type: IPv4
Connector:Endpoint: binding LWIP network instance...
Connector:Endpoint:build(): No device manager installed.
Connector:Endpoint:build(): adding static resources...
Connector:Endpoint:build(): adding dynamic resources...
Connector:Endpoint:build(): binding dynamic resource: [311/0/5850]...
LED: [311/0/5850] value: [] bound (observable: 0)
Connector:Endpoint:build(): binding dynamic resource: [888/0/7700]...
Accelerometer: [888/0/7700] value: [{"accelX": -44, "accelY": -85, "accelZ": 10}...]
(observeEndpoint: start: finalize and run the endpoint main loop...
mbedEndpointNetwork(Ethernet): configuring de-registration button...
mbedEndpointNetwork(Ethernet): registering endpoints...
Connector:Endpoint: endpoint registered...
mbedEndpointNetwork(Ethernet): endpoint main loop beginning...
Connector:Endpoint: endpoint registered.
```

Status Check

So far we've completed the following

Setup our accounts and PC with appropriate tools (prior to workshop)...

Retrieved a set of provisioning credentials (mbed_cloud_dev_credentials.c)

Imported our mbed sample project into the online IDE

Updated the sample project with the provisioning credentials (mbed_cloud_dev_credentials.c)

Compiled, Installed, Downloaded, and Copied into the mbed device

Connected a Serial Terminal (115200,8N1, proper mbed COM port chosen for Windows users...)

Sent the “Break” command to reset the mbed device

Saw the device output on our Serial Terminal (PTSOI method...)

Next, we will import and configure the ARM Google Prototype mbed Cloud Bridge...

ARM Google mbed Cloud Bridge Setup

What we will do next...

Ensure that we have the necessary pre-requisites setup on our PC

Create our mbed Cloud API Key/Token

Create our Google Service Account & Authentication JSON

Enable the Pub/Sub API

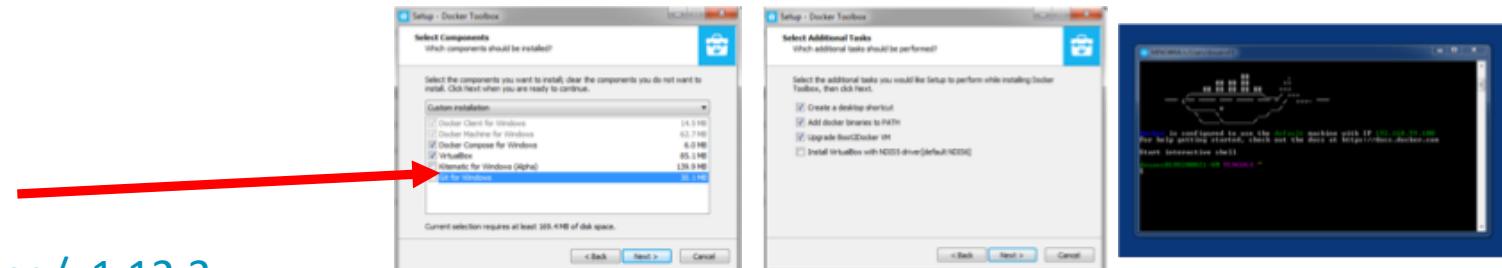
Import our Prototype mbed Cloud Bridge instance as a Docker image into our Docker runtime

Configure our Prototype mbed Cloud Bridge for Google Cloud

Double check (Windows) : All our needed tools are installed

Latest Docker Toolbox runtime installed

- Ensure that “Git for Windows” is checked!
- <https://github.com/docker/toolbox/releases/tag/v1.12.2>



Windows mbed USB driver installed and functioning properly.

- “DAPLINK” flash drive present
- “mbed Serial Port” seen in Windows Device Manager when K64F USB is connected

Putty installed and operational

Chrome and/or Firefox installed

Double check (Mac/Linux) : All our needed tools are installed

Docker Engine installed (do not install the "Toolbox" version on Mac... use the native engine)

- Docker Engine for Mac (do not install the "Toolbox" version on the mac):
 - <https://docs.docker.com/engine/installation/mac/>
- Docker Engine for Linux:
 - <https://docs.docker.com/engine/installation/linux/>

Suitable serial terminal installed and operational

Chrome and/or Firefox installed

"git" installed

Access to a command line terminal

Create our mbed Cloud Access/API Token

Navigate to the mbed Cloud Dashboard: <https://portal.mbedcloud.com>

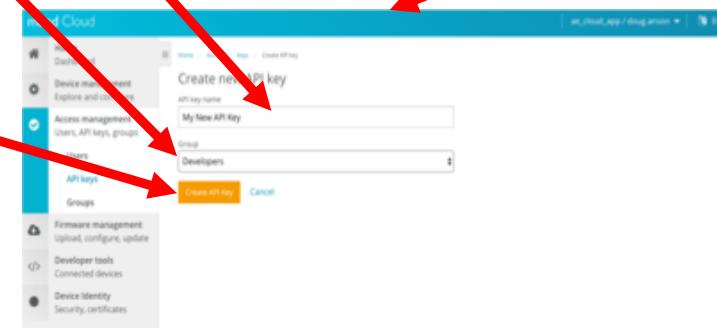
Log in, Select “Access Management”, then “API keys”

Press “Create new API Key ” ... you will create a key

Give the new API Key a name

Select “Developers” group

Create the API Key



Press “copy to clipboard” – save to a file for later use

Key name	Groups	Date last connected	Date created
AWS IoT	1	-	April 19, 2017 4:51 PM
Home	1	-	April 19, 2017 4:51 PM
IBM Watson	1	-	April 19, 2017 4:49 PM
MS IoT Hub	1	-	April 19, 2017 4:50 PM
Test	1	-	April 19, 2017 4:51 PM

Create/Name our Google Cloud Default Project

Go to your Google Cloud Console



Select “Project Settings”

New Project name: “mbed Cloud Bridge”

- Press “Save”
- Refresh your browser!

Confirm that the default project name has changed

Create a Service Account

Go to your Google Cloud Dashboard

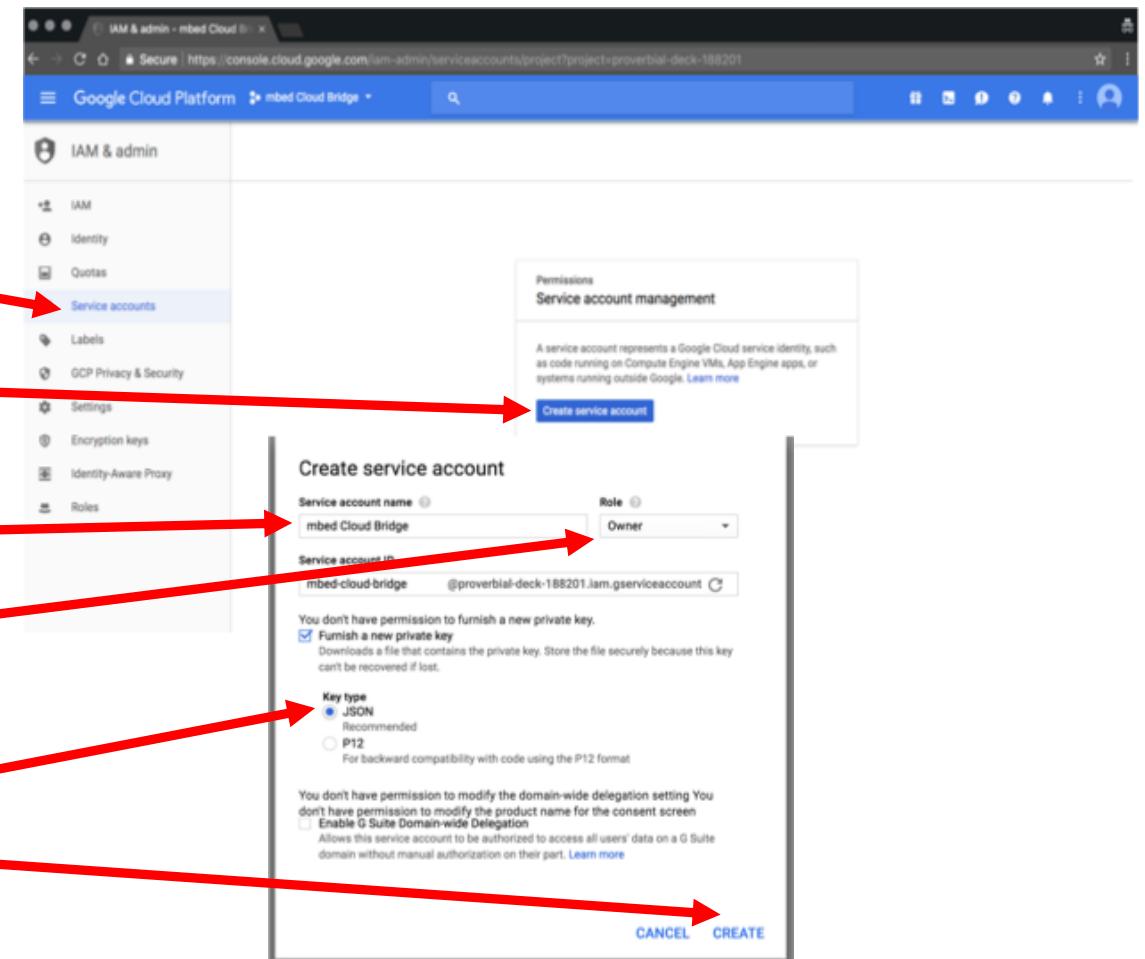
Select “Service Account”

Press “Create a Service Account”

Name the service account

Select “Owner”

Confirm “JSON” selected, press Create



Save off this file – you'll need it later.

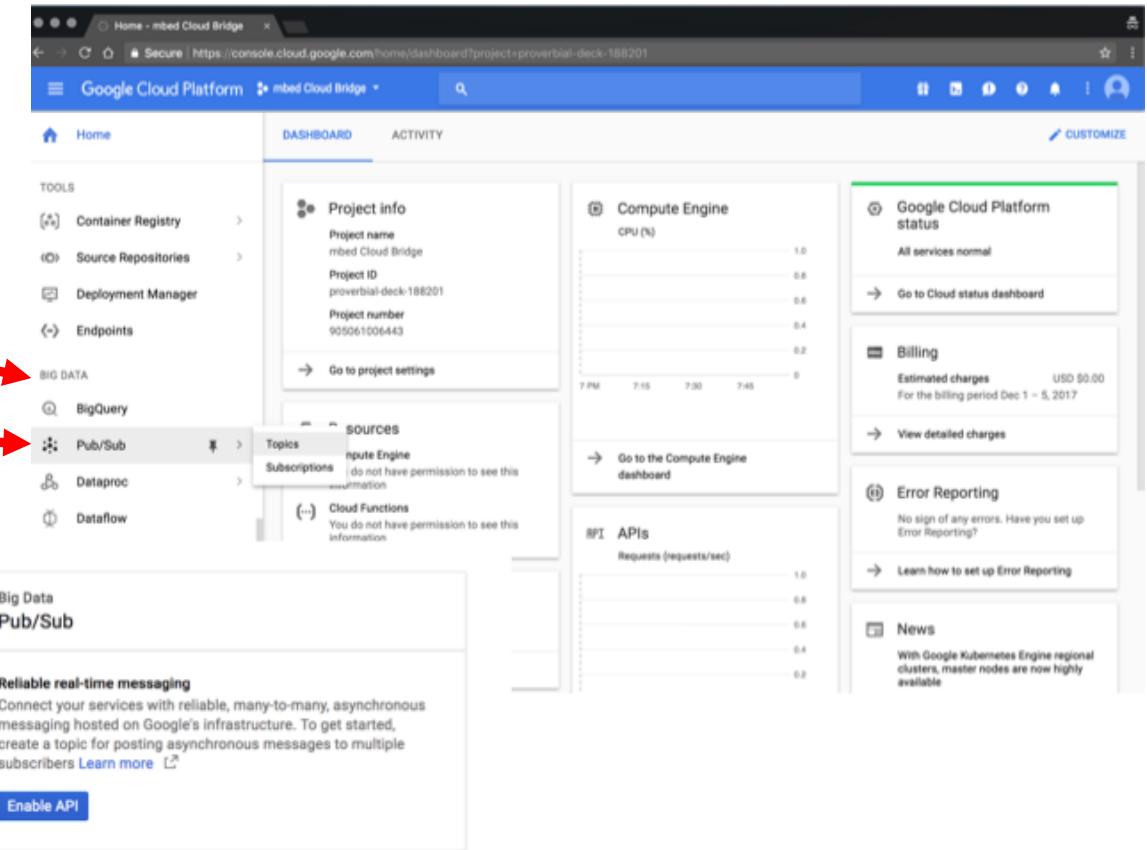
Create a Pub/Sub Service Instance

Go to the Google Cloud Dashboard

Scroll down to the “Big Data” section

Select “Pub/Sub”

Press “Enable API”



Once created, our Google Cloud Environment is ready for our bridge!

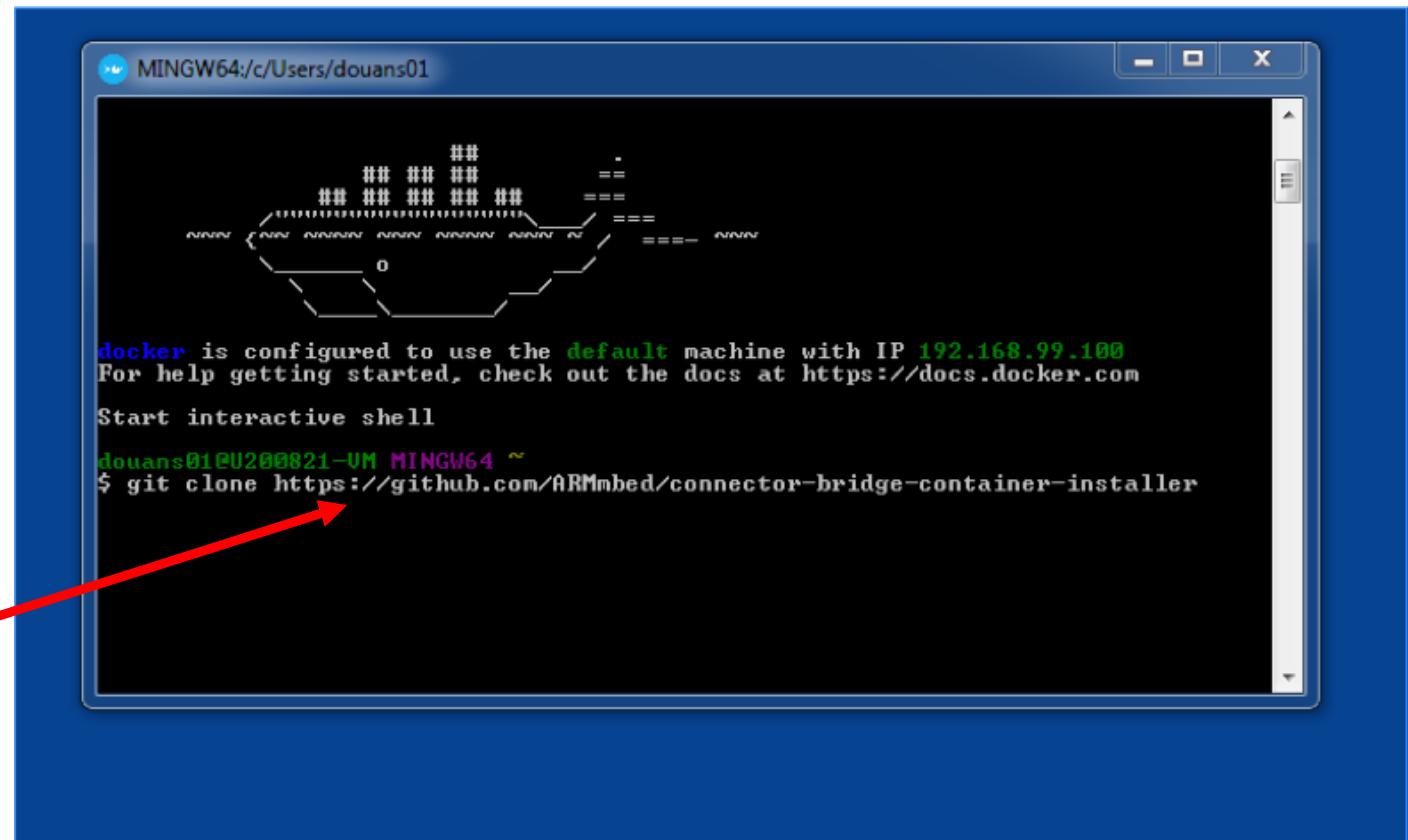
Import our mbed Cloud Google Bridge Installer

Windows: Launch the Docker QuickStart Terminal

- It may take a few minutes to initialize if launched the first time... it will have to download additional stuff
 - Allow VirtualBox to make changes to your network interface

Mac/Linux: Open a terminal

Type the following “git” command (below)



For all platforms (Windows/Mac/Linux), this is the "git" command to run:
\$ git clone <https://github.com/ARMmbed/connector-bridge-container-installer>

Import our mbed Cloud Google Bridge Container

cd into the installer repo

```
% cd connector-bridge-container-installer
```

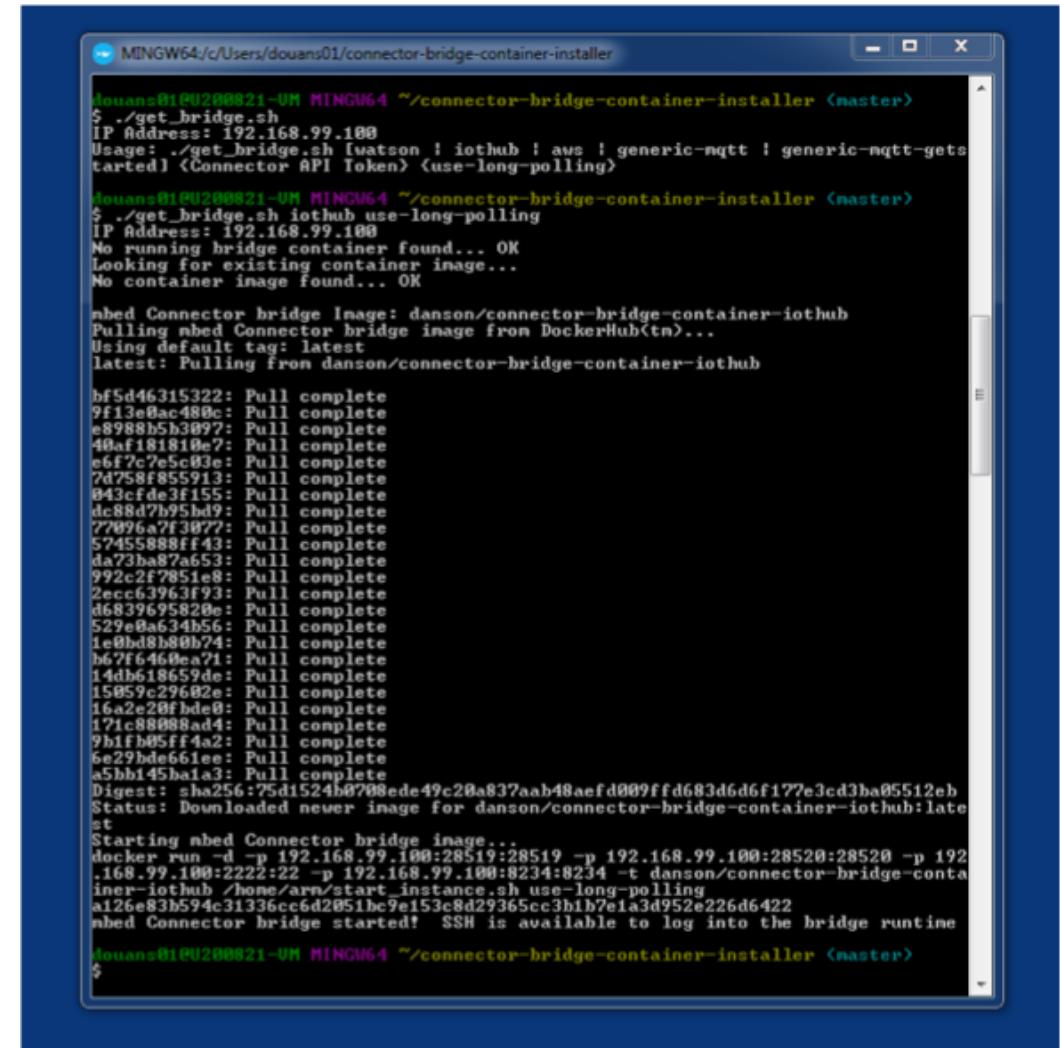
Run the installer script (look at options)

```
% ./get_bridge.sh
```

Run the installer script with options

```
% ./get_bridge.sh google use-long-polling
```

Bridge container will import from DockerHub



```
douans01@EU200821-VM MINGW64 ~/connector-bridge-container-installer <master>
$ ./get_bridge.sh
IP Address: 192.168.99.100
Usage: ./get_bridge.sh [watson | iothub | aws | generic-mqtt | generic-mqtt-gets
tarted] <Connector API Token> <use-long-polling>

douans01@EU200821-VM MINGW64 ~/connector-bridge-container-installer <master>
$ ./get_bridge.sh iothub use-long-polling
IP Address: 192.168.99.100
No running bridge container found... OK
Looking for existing container image...
No container image found... OK

mbed Connector bridge Image: danson/connector-bridge-container-iothub
Pulling mbed Connector bridge image from DockerHub<tm>...
Using default tag: latest
latest: Pulling from danson/connector-bridge-container-iothub

bf5d46315322: Pull complete
9f13ebac480c: Pull complete
e89885b3097: Pull complete
40af181810e7: Pull complete
e6f7c7e5c03e: Pull complete
7d758f855913: Pull complete
043cfde3f155: Pull complete
dc88d7b95bd9: Pull complete
77096a7f3077: Pull complete
5745588ff43: Pull complete
da73ba87a653: Pull complete
992e2f7851e8: Pull complete
2ecc63963f93: Pull complete
d6839695820e: Pull complete
529e0a634b56: Pull complete
1e0bdb8b0b74: Pull complete
b67f6460ea71: Pull complete
14db618659de: Pull complete
15059c29602e: Pull complete
16a2e20fbde0: Pull complete
171c88088ad4: Pull complete
9b1fb05ff4a2: Pull complete
6e29bde661ee: Pull complete
a5bb145ba1a3: Pull complete
Digest: sha256:75d1524b0708ede49c20a837aab4aef009ffd683d6d6f177e3cd3ba05512eb
Status: Downloaded newer image for danson/connector-bridge-container-iothub:late
st
Starting mbed Connector bridge image...
docker run -d -p 192.168.99.100:28519 -p 192.168.99.100:28520 -p 192
.168.99.100:2222:22 -p 192.168.99.100:8234:8234 -t danson/connector-bridge-conta
iner-iothub /home/arm/start_instance.sh use-long-polling
a126e83b594c31336cc6d2051bc9e153c8d29365cc3b1b7e1a3d952e226d6422
mbed Connector bridge started! SSH is available to log into the bridge runtime

douans01@EU200821-VM MINGW64 ~/connector-bridge-container-installer <master>
$
```

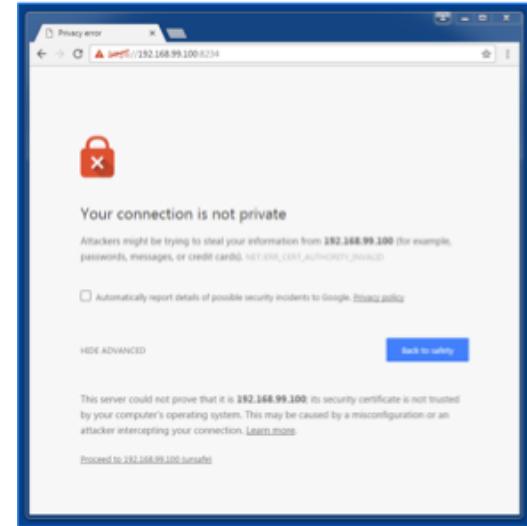
Configure our Google Bridge (Windows)

Your Container IP address will be:

192.168.99.100

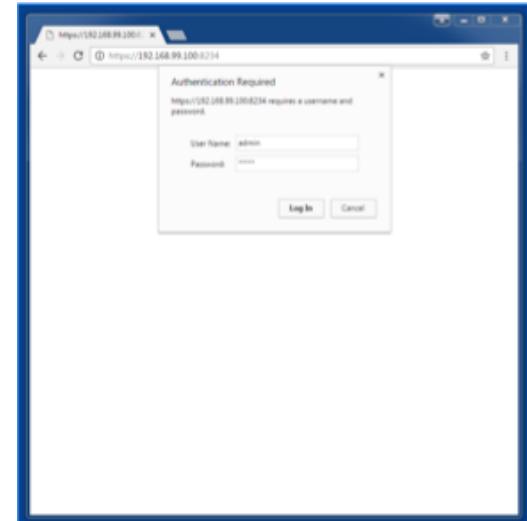
Bring up Firefox/Chrome and go to:

<https://192.168.99.100:8234>



Accept the self signed certificate

Username: admin PW: admin

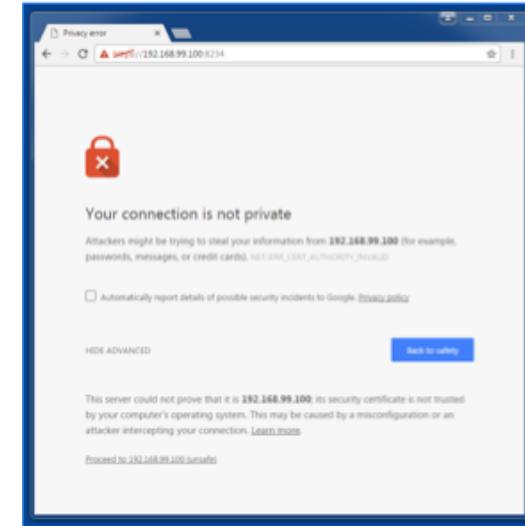


Configure our Google Bridge (Mac/Linux)

Your Container IP address be "localhost" if installed on your local box, otherwise, make note of it if installed remotely

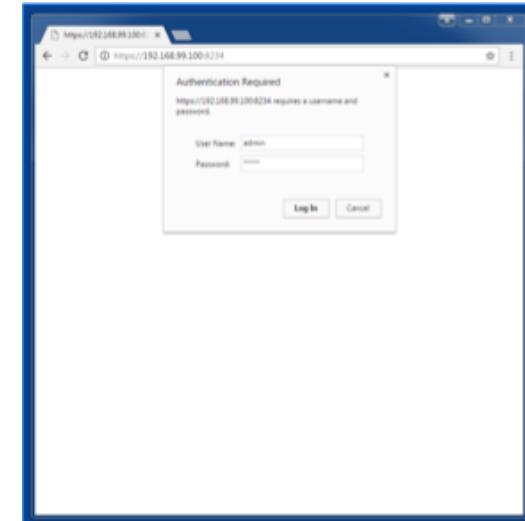
Bring up Firefox/Chrome and go to:

<https://<your container IP address>:8234>
(typically: <https://localhost:8234>)



Accept the self signed certificate

Username: admin PW: admin



Configure the mbed Cloud Bridge for Google...

Enter the mbed Cloud API Key/Token, *THEN* Press "Save"

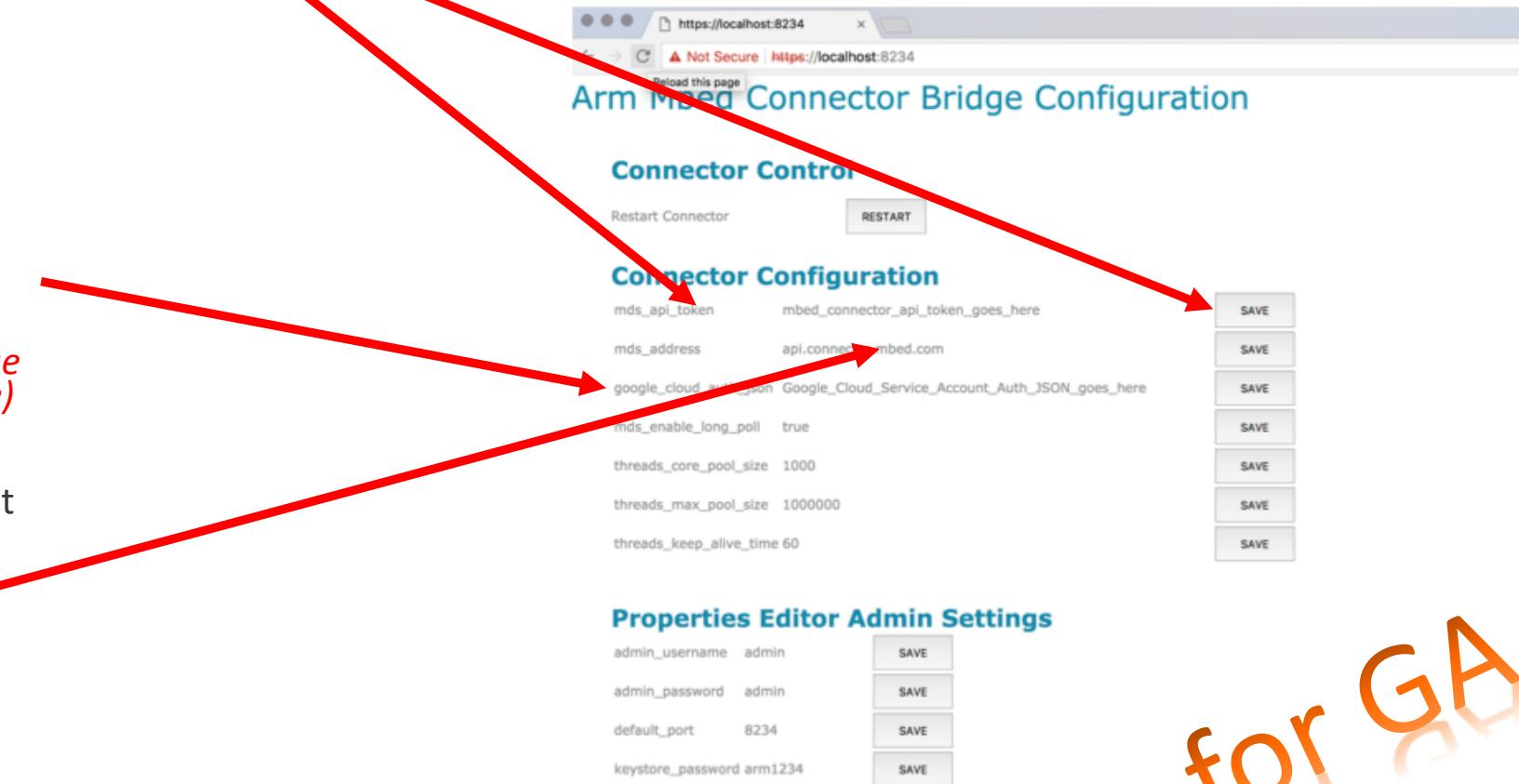
Enter your Google Auth JSON, Press "Save"
*NOTE: make sure you are pasting raw text!
-html markup will botch the config file...you
then have to "./remove_bridge.sh"
and "./get_bridge.sh" to retry...(slide 25)
if, after saving part of the configuration page
disappears, you'll have to re-pull per above)*

Ensure you have the right mbed API endpoint

- Cloud: api.us-east-1.mbedcloud.com
- Connector: api.connector.mbed.com
- If changed... be sure to press "Save"

Press "RESTART"

Your mbed Cloud Bridge is now configured for Google Cloud



Update for GA

arm

Putting it all Together

Press the “reset” button on your mbed device (next to the USB port)

Ensure that you see “endpoint registered” in the serial terminal

Go to the mbed Cloud Portal dashboard: <https://portal.us-east-1.mbed.cloud.com>

Look for your endpoint in the list



Record your endpoint's Device ID
You'll need this in the next steps...



Lets check how things are working...

The screenshot shows the mbed Cloud Portal Devices page. The left sidebar has navigation links: Dashboard, Metrics, usage, Device directory, Device identity, Firmware update, Access management, and Help. The main area is titled "Devices" with a sub-header "View and manage your devices. For help connecting devices, see the documentation." It includes a search bar, filter buttons (Connected only, Device type), and export options. A table lists devices with columns: Device ID, Name, State, Date created, and Date last updated. The first few rows show device IDs starting with 016008b and 0156fb7, all in a deregistered state.

Device ID	Name	State	Date created	Date last updated
016008b/0b78ac000000000000001001	016008b-9bac-0000-0000-000298	deregistered	November 29, 2017 5:10 PM	November 29, 2017 5:10 PM
016008b/435ab0000000000000000100	016008b4-35ab-0000-0000-00010000000c	deregistered	November 29, 2017 5:55 AM	-
016008b/4352b0000000000000000100	016008b4-352b-0000-0000-000100000009	deregistered	November 29, 2017 5:55 AM	-
016008b/4352b0000000000000000100008	016008b4-352b-0000-0000-000100000008	deregistered	November 29, 2017 5:55 AM	-
0156fb7/0ad2000000000000000001001	0156fb7-fad2-0000-0000-000100000006	deregistered	November 17, 2017 3:34 PM	November 29, 2017 12:57 PM

Install the Google Exerciser Application

Install Java 8 JDK: <http://www.oracle.com/technetwork/java/javase/downloads/jdk8-downloads-2133151.html>

Install Java and the NetBeans IDE <http://www.netbeans.org> (Java SE support or “All”... either should be OK)

Clone the following GitHub repo: <https://github.com/ARMmbed/GoogleCloudConnectorExerciser>

Import into NetBeans as a Maven Project

Select this source file

```
GoogleCloudConnectorExerciser - NetBeans IDE 8.2
Projects Files Services <default config> T G M
connector-bridge
+ GoogleCloudConnectorExerciser
  + Source Packages
    + com.arm.google.wrappers
    + com.arm.googlecloudconnectorexerciser
      + CloudConnectorExerciser.java
        + CloudConnectorMessageHandlerThread.java
        + com.arm.json
        + Test Packages
        + Other Sources
        + Dependencies
        + Java Dependencies
        + Project files
        + mbed-edgedx-shadow-service
        + mbed-properties-editor
Source History <Search (F3)> <Find (Ctrl+F)> <Replace (Ctrl+Shift+F)> <Copy (Ctrl+C)> <Paste (Ctrl+V)> <Delete (Ctrl+Shift+D)> <Format (Ctrl+Shift+F)> <Comment (Ctrl+Shift+L)> <Uncomment (Ctrl+Shift+U)> <Format Selection (Ctrl+Shift+F)> <Comment Selection (Ctrl+Shift+L)> <Uncomment Selection (Ctrl+Shift+U)> <Format Line (Ctrl+Shift+F)> <Comment Line (Ctrl+Shift+L)> <Uncomment Line (Ctrl+Shift+U)> <Format Block (Ctrl+Shift+F)> <Comment Block (Ctrl+Shift+L)> <Uncomment Block (Ctrl+Shift+U)> <Format Selection Block (Ctrl+Shift+F)> <Comment Selection Block (Ctrl+Shift+L)> <Uncomment Selection Block (Ctrl+Shift+U)>
47 /**
48  * Google Cloud Connector Exerciser
49  *
50  * @author Doug Anson
51 */
52 public class GoogleCloudConnectorExerciser {
53     // Google Auth JSON gets copied into this file
54     // File Location: top-level directory for this project (ordinary text file with JSON copied/pasted)
55
56     private static final String GOOGLE_AUTH_JSON_FILE = "google_auth.json";
57
58     // These need to mimick the endpoint name, endpoint type, and CoAP resource uri used
59     // - for https://github.com/ARMmbed/mbed-cloud-sample, only set the ENDPOINT_NAME to
60     //   the created device name for your endpoint... all other settings are already OK.
61     private static final String ENDPOINT_NAME = "<endpoint_name_goes_here>";
62     private static final String ENDPOINT_TYPE = "<endpoint>";
63     private static final String COUNTER_RESOURCE = "/123/0/4567";
64     private static final String LED_RESOURCE = "/311/0/5850";
65
66     // really nothing else below needs to be set... Please forward down to
67     // "IMPORTANT NOTE" to learn more about the expected subscription and topic
68     // mappings
69     // topics and subscriptions in connector format
70     private String m_connector_counter_topic = null;
71     private String m_connector_led_topic = null;
72     private String m_connector_led_put_ON = null;
73     private String m_connector_led_put_OFF = null;
74     private String m_connector_led_response_topic = null;
```

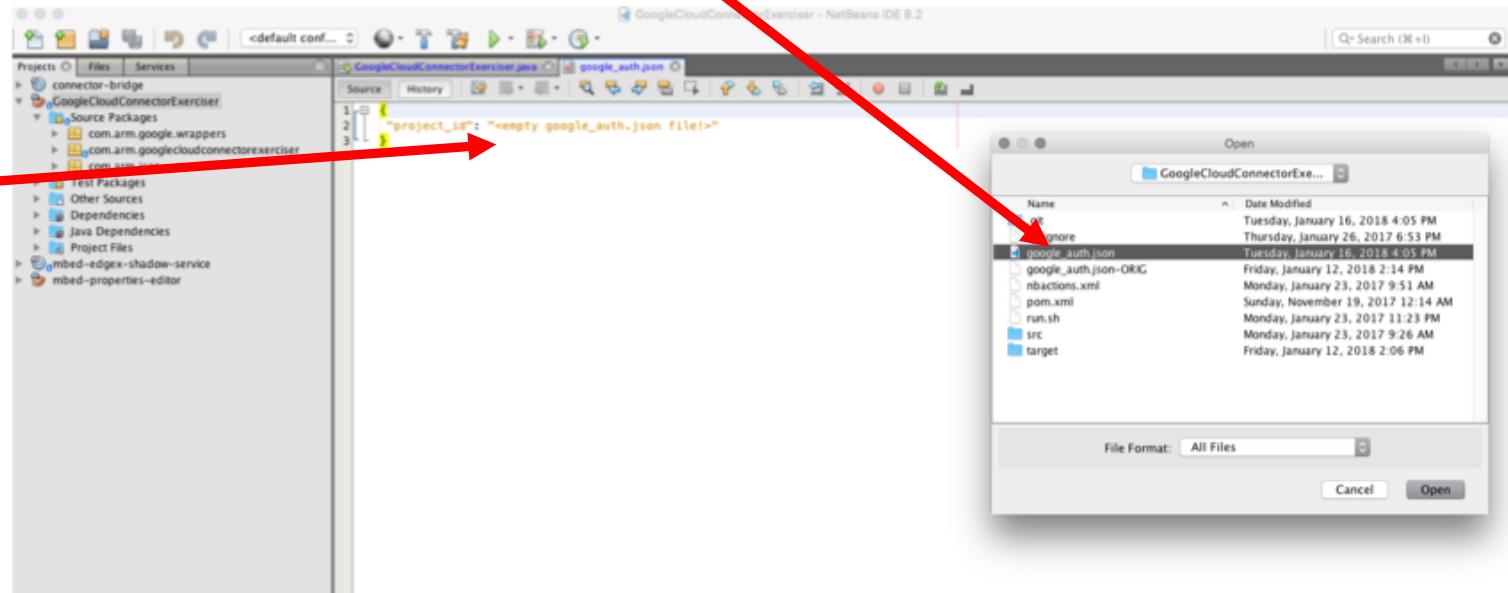
Enter your mbed Cloud Endpoint Device ID you saved!

Configuring the Google Exerciser Application (Auth)

In NetBeans, select File->Open.

Navigate to the project root directory and open “google_auth.json”

Paste the contents of your
Google auth json and save.



Status Check

So far we've completed the following

Ensure that we have the necessary pre-requisites setup on our PC

Create our mbed Cloud API Key/Token

Create our Google Service Account & Authentication JSON

Enable the Pub/Sub API

Import our bridge instance: a Docker image into our Docker runtime

Configure our mbed Cloud Bridge for Google

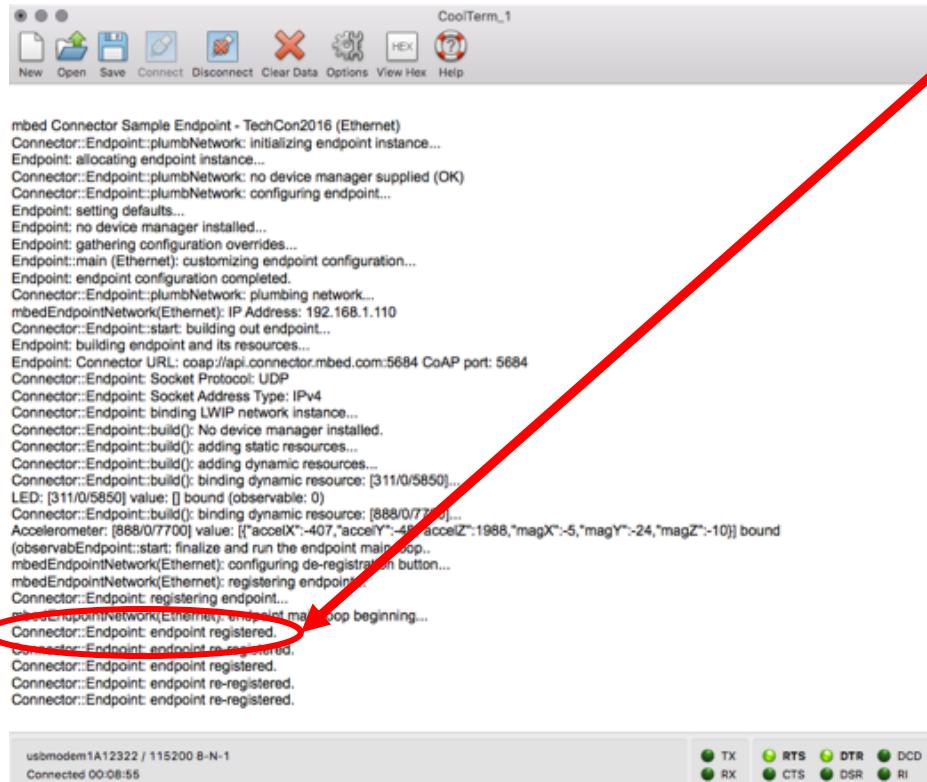
Installed and configured the “Exerciser” Application

With our bridge now operational, we should be able to restart our endpoint and see messages coming into our Google via a java-based “Exerciser” Application

Putting it all Together: Check the Serial Terminal

Press the deregister button (**SW3, slide 6**)... wait about a minute or so... now Reboot your endpoint.... You should see output that looks something like this:

Make sure that you see a message like “endpoint registered”



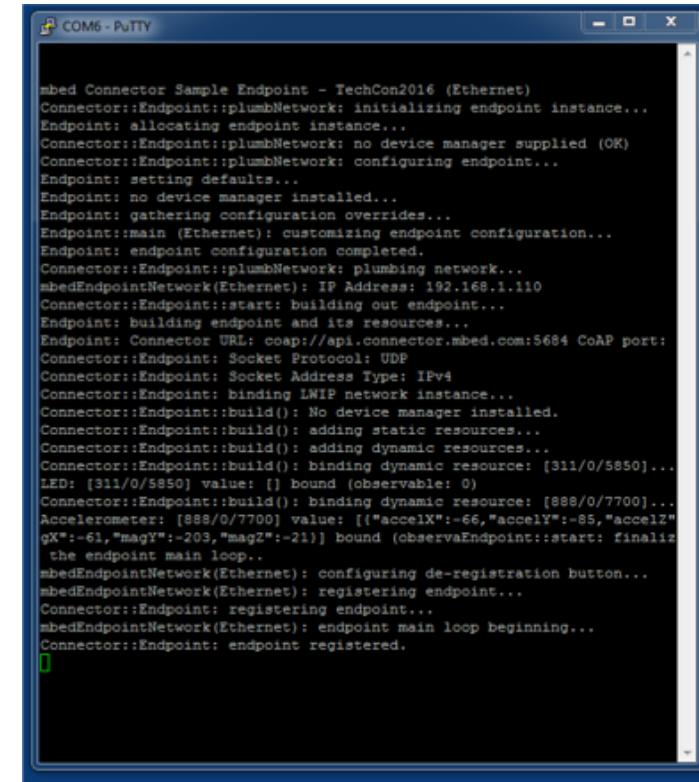
CoolTerm_1

New Open Save Connect Disconnect Clear Data Options View Hex Help

```
mbed Connector Sample Endpoint - TechCon2016 (Ethernet)
Connector::Endpoint::plumbNetwork: initializing endpoint instance...
Endpoint: allocating endpoint instance...
Connector::Endpoint::plumbNetwork: no device manager supplied (OK)
Connector::Endpoint::plumbNetwork: configuring endpoint...
Endpoint: setting defaults...
Endpoint: no device manager installed...
Endpoint: gathering configuration overrides...
Endpoint::main (Ethernet): customizing endpoint configuration...
Endpoint: endpoint configuration completed.
Connector::Endpoint::plumbNetwork: plumbing network...
mbedEndpointNetwork(Ethernet): IP Address: 192.168.1.110
Connector::Endpoint::start: building out endpoint...
Endpoint: building endpoint and its resources...
Endpoint: Connector URL: coap://api.connector.mbed.com:5684 CoAP port: 5684
Connector::Endpoint: Socket Protocol: UDP
Connector::Endpoint: Socket Address Type: IPv4
Connector::Endpoint: binding LWIP network instance...
Connector::Endpoint::build(): No device manager installed.
Connector::Endpoint::build(): adding static resources...
Connector::Endpoint::build(): adding dynamic resources...
Connector::Endpoint::build(): binding dynamic resource: [311/0/5850]...
LED: [311/0/5850] value: [] bound (observable: 0)
Connector::Endpoint::build(): binding dynamic resource: [888/0/7700]...
Accelerometer: [888/0/7700] value: [{"accelX": -407, "accelY": -41, "accelZ": 1988, "magX": -5, "magY": -24, "magZ": -10}] bound
(observable)Endpoint::start: finalize and run the endpoint main loop...
mbedEndpointNetwork(Ethernet): configuring de-registration button...
mbedConnector Sample Endpoint - TechCon2016 (Ethernet)
Connector::Endpoint: registering endpoint...
mbedEndpointNetwork(Ethernet): endpoint main loop beginning...
Connector::Endpoint: endpoint registered.
Connector::Endpoint: endpoint re-registered.
Connector::Endpoint: endpoint registered.
Connector::Endpoint: endpoint re-registered.
Connector::Endpoint: endpoint re-registered.
```

usbmodem1A12322 / 115200 B-N-1
Connected 00:08:55

TX	RTS	DTR	DCD
RX	CTS	DSR	RI

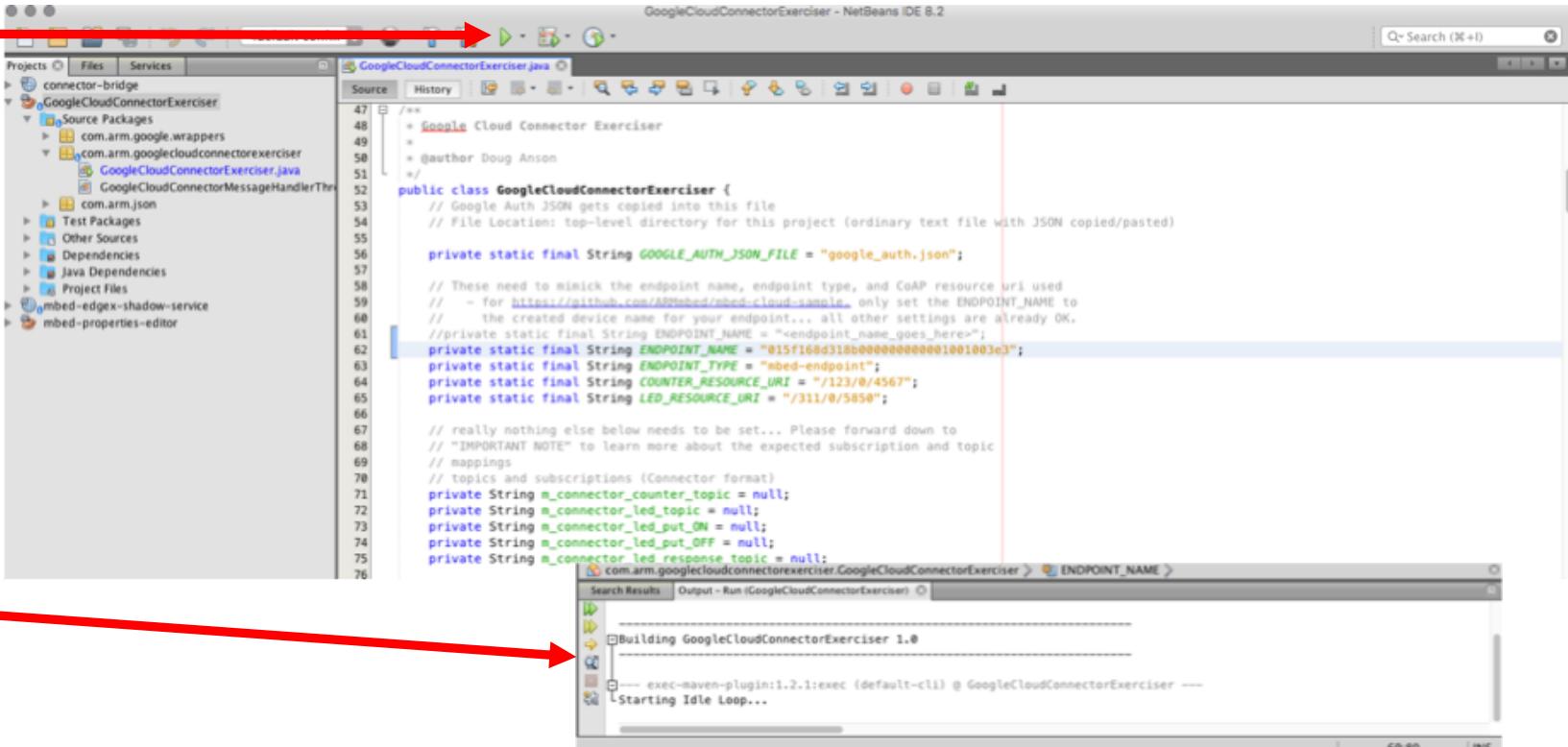


COM6 - PuTTY

```
mbed Connector Sample Endpoint - TechCon2016 (Ethernet)
Connector::Endpoint::plumbNetwork: initializing endpoint instance...
Endpoint: allocating endpoint instance...
Connector::Endpoint::plumbNetwork: no device manager supplied (OK)
Connector::Endpoint::plumbNetwork: configuring endpoint...
Endpoint: setting defaults...
Endpoint: no device manager installed...
Endpoint: gathering configuration overrides...
Endpoint::main (Ethernet): customizing endpoint configuration...
Endpoint: endpoint configuration completed.
Connector::Endpoint::plumbNetwork: plumbing network...
mbedEndpointNetwork(Ethernet): IP Address: 192.168.1.110
Connector::Endpoint::start: building out endpoint...
Endpoint: building endpoint and its resources...
Endpoint: Connector URL: coap://api.connector.mbed.com:5684 CoAP port: 5684
Connector::Endpoint: Socket Protocol: UDP
Connector::Endpoint: Socket Address Type: IPv4
Connector::Endpoint: binding LWIP network instance...
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Connector::Endpoint::build(): adding dynamic resources...
Connector::Endpoint::build(): binding dynamic resource: [311/0/5850]...
LED: [311/0/5850] value: [] bound (observable: 0)
Connector::Endpoint::build(): binding dynamic resource: [888/0/7700]...
Accelerometer: [888/0/7700] value: [{"accelX": -66, "accelY": -85, "accelZ": 1988, "magX": -61, "magY": -203, "magZ": -21}] bound
(observable)Endpoint::start: finalize and run the endpoint main loop...
mbedEndpointNetwork(Ethernet): configuring de-registration button...
mbedEndpointNetwork(Ethernet): registering endpoint...
Connector::Endpoint: registering endpoint...
mbedEndpointNetwork(Ethernet): endpoint main loop beginning...
Connector::Endpoint: endpoint registered.
```

Running the Google Exerciser Application

Press the “Run” button



The project will compile

If the compile succeeds without error, the project will run...

You should see output down here

The Exerciser will turn the LED resource on and off depending on whether the monotonic resource observation value (resource /123/0/4567) is even or odd... this demonstrates the bi-directional nature of the bridge with your endpoint!

CONGRATS!! You are finished!!



arm

Thank You!!