Instructions: Setup CSP managed ATC application (via Mote Agent) on Raspberry Pi 3+

Follow the following instructions to run integrated *mote agent* and *ATC application* on **raspberry pi 3+**

## ) Install Raspberry Pi OS

1. Download OS zip from <https://downloads.raspberrypi.org/raspios_full_armhf_latest>
2. For raspberry pi we do not have a serial console . We shall rather use HDMI cable and a screen for installation . Please connect ethernet cable, usb mouse and keyboard to your raspberry pi
3. Unzip the downloaded zip and a .img format file will be extracted
4. Insert your sd card in sd card reader of your pc and flash the extracted .img file into your sd card
5. For linux host system you can “disks” utility to check the mount point and unmount all partitions (e.g /dev/mmcblk0 ) and then issue following command:

>>**sudo dd if=[path to .img] of=[path to mount point] bs=4M**

1. Insert the sd card into raspberry pi and keep a note of monitor over HDMI.
2. Raspberry PI OS will boot and prompt will ask you for some basic information like keyboard , location, changing password(To ensure problem free working please change the password) Please select what suits you . When it asks for wifi information please skip the remaining steps
3. On your HDMI screen you shall see on the upper right corner a black icon(first one) . Please click it as it shall open the linux console
4. Issue the following command on it(Note that its one line)

>>wget -v -O prepare\_rpi <https://m3-shared-storage.s3-eu-west-1.amazonaws.com/mote/prepare_rpi> && chmod +x prepare\_rpi && ./prepare\_rpi

**f)** Now the raspberry pi 3 environment is ready for mote agent

**g)** After the command in step ‘i’ you shall see the following output :

**\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\***

**\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* Serial Number : CSP-B827EBDD5BF4 \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\***

**\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* Host Name : csp-b827ebdd5bf4 \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\***

**\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* Raspberry Pi3+ is ready for CSP Mote Agent \*\*\*\*\*\*\*\*\*\*\***

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**h)** Please note the serial number as you application has the option to use it as its serial number . Anyhow for ATC for the particular device this shall be the serial number . If you are going for an atc application, please provision a peripheral device against the above serial number. Please also not the host name as it will come handy in accessing the mote via ssh .

## 1.2) Make the connections

1. Please make the basic power connections as mentioned in the official NOOBs tutorial
2. Take a USB to Serial cable of beagle bone "**Adafruit PL2303**" and connect beagle bone TX (**Green jumper**) to "**BCM\_15**" pin 10 of RPI3+. Connect beagle bone RX (**White jumper**) to "**BCM\_14**" PIN 8 of RPI3+ on the expansion header. Connect ground of cable (**Black jumper**) to the “**GND**” of board expansion header(pin 6 for instance). Let’s call this cable "**AOIM channel cable**". You can use <https://pinout.xyz/> for a better visual aid. This shall be enough to run mote agent . Remaining connections are for ATC
3. For ATC, the *Temperature* *Sensor*, connect SDA of temperature sensor to “**BCM 2**” pin 3 , SCL to “**BCM 3**” pin 5, VDD to pin 1, GND to pin 9.
4. Also note the following actuator signals for ATC demo

**BCM 17** (pin 11)- *HEATING ACTUATING SIGNAL*

**GPIO 27** -(pin 13) *COOLING ACTUATING SIGNAL*

**GPIO 22** – (pin 15) *FAN ACTUATING SIGNAL*

1. If you want to run your mote over Ethernet then connect the Ethernet cable with mote.

## 1.3) Install the ATC-COMBO application

1. You can either ssh(using hostname) into mote or continue to use HDMI screen.
2. Go to console of your mote and issue following command :

>> **wget -v -O startup\_script\_rpi** [**https://m3-shared-storage.s3-eu-west-1.amazonaws.com/mote/startup\_script\_rpi**](https://m3-shared-storage.s3-eu-west-1.amazonaws.com/mote/startup_script_rpi) **&& chmod +x startup\_script\_rpi**

1. Get the IP of Mote hardware by using issuing “***ifconfig***” on serial console as follows:

**>>ifconfig**

*eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500*

*inet 192.168.1.3 netmask 255.255.255.128 broadcast 192.168.1.127*

*inet6 fe80::722c:1fff:fe23:dac3 prefixlen 64 scopeid 0x20<link>*

*ether 70:2c:1f:23:da:c3 txqueuelen 1000 (Ethernet)*

*RX packets 85 bytes 21246 (20.7 KiB)*

*RX errors 0 dropped 15 overruns 0 frame 0*

*TX packets 64 bytes 8131 (7.9 KiB)*

*TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0*

IP address in the above example comes to be **192.168.1.3.**

1. For installing ethernet mote atc-combo firmware issue following command on serial console

**>>./startup\_script\_rpi ethernet**

1. Or for installing wifi mote atc-combo firmware issue following command on serial console.

**>>./startup\_script\_rpi wifi**

1. The above step may take some time, so hold back and wait until the process has completed.
2. Note that the above commands will install latest atc firmware against latest mote agent . The other option is to provide the required agent version and firmware version and the script will download that combo for example
3. **>>./startup\_script\_rpi ethernet 4.0.5 2.0.4**
5. Once the process is completed, ***(ATC + Mote agent)*** will start executing in Blank State.
6. Now connect the USB part cable "AOIM channel cable" to your PC as mentioned in *Section 1.2 point 3*. Note the new ***Communication Port/File*** appear on your system. In case of Linux, see a new entry in **/dev/ttyUSB\*** and in case of windows, see a new entry in ports through device manager (Something like COM6).
7. Make sure that the mote against this Serial Number is created at the Backend and is attached with the gateway of sure choice. Please note that this point is very important and without ensuring this point mote will not function
8. To run the ATC application, commission the following docker images on gateway:

**a)** **Managed-MQTT-Broker 1.1**.

**b)** **ATC 1.1**

Start in the following sequence:

* **Start Managed broker**
* **Start Controller application**

1. Now start the ***mote-setup-client*** which will ask for the serial number of your mote and the corresponding **serial device file/port**. Choose it and the application shall start injecting credentials. Once successful, mote will be in *Ready* *State* going for *Operational* *State*. Please ensure that the gateway with which the mote is attached is up, running and accessible.
2. You can check logs by issuing following commands

>> tail -f /var/log/mgc/csp.log

>> tail -f /var/log/mgc/atc.log

**1.4) Update Gateway Address**

During the initial credentials injection, *gateway IP* against which mote is attached is also injected. The problem is that mostly the gateway IP is *dynamic* and can *change*. The Mote setup application also has the button to update this IP under network config “**Update Broker**”.