Stratux - Mobile Station Set-up

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Summary

This page provides instructions on one known method to configure a Stratux (ADS-B) receiver to feed CoT information to an OG TAKServer or FreeTAKServer to observe PLI of aircraft within the device's coverage area. The configuration described below is intended for a mobile application to observe surrounding aircraft locations and feed ATAK EUDs on a LAN in LTE-denied areas.

Parts List

The following are parts utilized for a successful implementation of Stratux feeds to OG TAKServer and FreeTAKServer. See <u>http://stratux.me/#diy-kits-and-parts</u> for details on alternative parts.

Minimum

1. <u>Raspberry Pi 3B</u> (not 3B+) - However <u>indications</u> are that Pi 4 models are supported now.

2. <u>Nooelec Dual Band NESDRs</u> - See <u>here</u> for alternative SDR's. [NOTE: Both 1090 and 978 SDRs are required for Stratux to operate].

3. sD Card with Stratux / Raspbian OS flashed onto it. <u>Stratux Image</u> is located <u>here</u>

Optional

1. <u>GPS Receiver</u> - See <u>here</u> for other GPS receiver options

2. <u>Stratux Case</u> (recommended for mobile applications).

Flash Stratux Image

Using your preferred image flashing application such as Pi Imager, BalenaEtcher, etc., flash the sD card with the latest Stratux image, which can be downloaded at:

https://github.com/cyoung/stratux/releases/download/v1.6r1-eu023-us/stratux-v1.6r1-eu023.img.zip

Initial Set-up / Configuration

Initial Boot

1. Install SDRs into the Raspberry Pi 3B board (NOTE: Ensure antennas are connected to the SDRs prior to powering them up).

2. Install the sD card into the Raspberry Pi 3B unit

3. Power the Raspberry Pi 3b (NOTE: ensure adequate voltage supply or you will receive multiple warnings possibly interrupting your initial configuration.

> ⚠️ NOTE: If you do not have access to an ethernet connection on your network, you will need to connect a keyboard and monitor to your Raspberry Pi 3B board PRIOR to powering up the unit.

Confirm Stratux Operating Status

Using any device with a web browser:

1. Connect to the "stratux" SSID / WiFi peer-to-peer network.

2. Connect to the web GUI at http://192.168.10.1 and ensure the Stratux operating status is "connected".

> ⚠️ If you do not have access to an ethernet port, and your RPi 3 is not already connected to a monitor, you will need to shut down the RPi in the "Settings" menu.

Open Terminal Session

After confirming the operating status, you will need to open a terminal connection by any of the methods below:

1. Connect directly to the device with a keyboard and monitor (easiest)

2. Connect via ssh with the RPi 3 connected to a local network using an ethernet connection. (You will need to be able to identify the ethernet IP address of your RPi on the network).

3. Connect via ssh with the RPi 3 using the "stratux" peer-to-peer network at IP address `192.168.10.1`

NOTE: If your Raspberry Pi 3 is connected to a LAN with internet access, you can also begin to install any networking tools, VPNs, and/or peer-to-peer network connections such as ZeroTier - depending on your application and/or TAK setup.

Disable p2p WiFi / Connect to WiFi Network(s)

> ⚠️ Raspberry Pi 3 units do not support 5Ghz WiFi - only 2.4Ghz. If your router or MiFi is capable, enable a 2.4Ghz network and generate an SSID for it. Refer to your networking equipment guides for instructions on how to do so.

The following instructions provide two options for connecting to a LAN via WiFi:

1. Single WiFi Client Mode: Fixed locations or a single mobile data device (i.e. you do not anticipate connecting to multiple access points); OR

2. Multiple WiFi Client Mode: For connecting to multiple known WiFi networks automatically if you anticipate several WiFi networks or MiFi access points for your application.

Prior to beginning this section

Regardless which configuration you wish to use, both require editing the network interface configuration file:

`sudo nano /etc/network/interface` , and you will see the following or similar in the file:

```
auto lo

iface lo inet loopback

allow-hotplug eth0
iface eth0 inet dhcp

allow-hotplug wlan0

iface wlan0 inet static
  address 192.168.10.1
  netmask 255.255.255.0
  pre-up /usr/sbin/rfkill unblock wifi
```

```
   post-up /usr/sbin/stratux-wifi.sh 0
   wireless-power off

allow-hotplug p2p-wlan0-0
iface p2p-wlan0-0 inet static
  address 192.168.10.1
  pre-up /usr/sbin/rfkill unblock wifi
  netmask 255.255.255.0
  post-up /bin/systemctl restart isc-dhcp-server
  post-down wpa_cli -i wlan0 terminate


####################################################################
##              Custom settings not for novice users!!!!!!
##              Modify at your own risk!!!!!!!!!!!!!!!!!!!
##
##   Second Wifi Dongle for local work and internet access
##   This template is for adding a second wifi dongle to your PI for internet access while debugging
##     Modify /etc/wpa_supplicant/wpa_supplicant.conf with your settings also( see below )
##
##   Uncomment the following lines as needed.
```

1. Single WiFi Client Mode / Fixed Location

A. EDIT /etc/network/interfaces File

Comment out (using '#') any line below the 6th entry: `allow-hotplug wlan0` and insert the
following:

```
iface wlan0 inet dhcp
        wpa-ssid "your_wifi_ssid"
        wpa-psk "your_wifi_password"
        wireless-power off
```

Your file should now look like the following with the bold font being your added lines:

```
auto lo

iface lo inet loopback

allow-hotplug eth0
iface eth0 inet dhcp

allow-hotplug wlan0

iface wlan0 inet dhcp
        wpa-ssid "your_wifi_ssid"
        wpa-psk "your_wifi-password"
        wireless-power off

# iface wlan0 inet static
```

```
#    address 192.168.10.1
#    netmask 255.255.255.0
#    pre-up /usr/sbin/rfkill unblock wifi
#
#    post-up /usr/sbin/stratux-wifi.sh 0
#    wireless-power off

# allow-hotplug p2p-wlan0-0
# iface p2p-wlan0-0 inet static
#    address 192.168.10.1
#    pre-up /usr/sbin/rfkill unblock wifi
#    netmask 255.255.255.0
#    post-up /bin/systemctl restart isc-dhcp-server
#    post-down wpa_cli -i wlan0 terminate


######################################################################
##                 Custom settings not for novice users!!!!!!
##                 Modify at your own risk!!!!!!!!!!!!!!!!!!!
##
##   Second Wifi Dongle for local work and internet access
##   This template is for adding a second wifi dongle to your PI for internet access while debugging
##      Modify /etc/wpa_supplicant/wpa_supplicant.conf with your settings also( see below )
##
##   Uncomment the following lines as needed.
```

After ensuring your information is correct, save the file and reboot the RPi at the command prompt: `sudo reboot` . Upon reboot, you should be able ssh into your stratux device. Skip to Install Stratuxcot and Dependencies

2. Multiple WiFi Client Mode

A. EDIT /etc/network/interfaces File

Comment out (using '#') any line below the 6th entry: `allow-hotplug wlan0` and insert the following:

```
iface wlan0 inet manual
            wpa-roam /etc/wpa_supplicant/wpa_supplicant.conf
            wireless-power off

iface default inet dhcp
```

The following is how your file should appear:

```
auto lo

iface lo inet loopback

allow-hotplug eth0
```

```
  iface eth0 inet dhcp

  allow-hotplug wlan0

  iface wlan0 inet manual
              wpa-roam /etc/wpa_supplicant/wpa_supplicant.conf
              wireless-power off

  iface default inet dhcp

  # iface wlan0 inet static
  #   address 192.168.10.1
  #   netmask 255.255.255.0
  #   pre-up /usr/sbin/rfkill unblock wifi
  #
  #   post-up /usr/sbin/stratux-wifi.sh 0
  #   wireless-power off

  # allow-hotplug p2p-wlan0-0
  # iface p2p-wlan0-0 inet static
  #   address 192.168.10.1
  #   pre-up /usr/sbin/rfkill unblock wifi
  #   netmask 255.255.255.0
  #   post-up /bin/systemctl restart isc-dhcp-server
  #   post-down wpa_cli -i wlan0 terminate


  ######################################################################
  ##              Custom settings not for novice users!!!!!!
  ##              Modify at your own risk!!!!!!!!!!!!!!!!!!!
  ##
  ##   Second Wifi Dongle for local work and internet access
  ##   This template is for adding a second wifi dongle to your PI for internet access while debugging
  ##     Modify /etc/wpa_supplicant/wpa_supplicant.conf with your settings also( see below )
  ##
  ##   Uncomment the following lines as needed.
```

CREATE / EDIT wpa_supplicant.conf File

Next, you will need to configure your wpa_supplicant.conf file with the following information regarding the WiFi networks to which you wish the devices connect:

1. Network SSID (network_ssid_#)

2. Key Managment Protocol (key_mgmt)

3. Network password (network_passwd_#)

4. Network Selection Priority (the higher the number, the higher the priority and is user-defined)

Configure or add the file with: `sudo nano /etc/wpa_supplicant/wpa_supplicant.conf`

Once in the file, add the following lines, as needed, for your setup:

```
country=US
ctrl_interface=DIR=/var/run/wpa_supplicant GROUP=netdev
update_config=1

network={
        ssid="network_ssid_1"
        key_mgmt=WPA-PSK
        psk="network_passwd_1"
        priority=3
}

network={
        ssid="network_ssid_2"
        key_mgmt=WPA-PSK
        psk="network_passwd_2"
        priority=2
}

network={
        ssid="network_ssid_3"
        key_mgmt=WPA-PSK
        psk="network_passwd_3"
        priority=1
}
```

After ensuring your information is correct, save the file and reboot the RPi at the command prompt: `sudo reboot` . Upon reboot, you should be able ssh into your stratux device. Skip to Install Stratuxcot and Dependencies

Install Stratuxcot and Dependencies

> ⚠️ If you are unable to ssh into stratux on your WiFi network after confirming the correct IP address, network information, and 2.4G status, then connect your RPi 3 to a keyboard and monitor and re-enable ssh by going into raspi-config: `sudo raspi-config` , and reboot.

At the command prompt, enter the following commands (in order):

1. `sudo apt update && sudo apt upgrade`

2. `sudo apt install python3` (if necessary)

3. `sudo apt install python3-pip`

4. `sudo pip3 install pytak[with_pymodes]`

5. `sudo pip3 install stratuxcot`

Start stratuxcot

Refer to Greg Albrecht's <u>stratuxcot site</u>, from which the information below was obtained:

Usage

The stratuxcot command-line program has several runtime arguments:

```
$ stratuxcot -h
usage: stratuxcot [-h] -U COT_URL -W STRATUX_WS [-S COT_STALE]

optional arguments:
  -h, --help            show this help message and exit
  -U COT_URL, --cot_url COT_URL
                        URL to CoT Destination.
  -W STRATUX_WS, --stratux_ws STRATUX_WS
                        Stratux Websocket URL.
  -S COT_STALE, --cot_stale COT_STALE
                        CoT Stale period, in seconds.
```

Example

Connect to the Stratux device at ws://127.0.0.1/traffic (using the <u>localhost</u> IP address), and forward CoT to TCP Port 8087 on Host [172.17.2.152]:

`stratuxcot -U tcp:172.17.2.152:8087 -W ws://127.0.0.1/traffic`

Replace 172.17.2.152 with the IP address for your TAKServer, FreeTAKServer, or ATAK EUD

⚠ The host IP address and port are dependent on your TAKServer, FTS, or ATAK EUD configuration. Please refer to your device(s) set up for the necessary IP address and ports.

💡 If streaming to a FreeTAKServer, add FTS_COMPAT=1 before the command above:

`FTS_COMPAT=1 stratuxcot -U tcp:[FTS_IP]:8087 -W ws://127.0.0.1/traffic`

See Greg Albrecht's <u>PyTAK site</u> for more: https://pypi.org/project/pytak/

ATAK EUD's IP address can be found in the Network Settings menu, and typically accept tcp traffic on port 4242.

FTS will take the stream on port 8087 if TCP is enabled.

Create Autostart File (systemd)

If you wish stratuxcot to start automatically at boot, then create a systemd service file by:

```
sudo nano /etc/systemd/system/stratuxcot.service
```

Then add the following lines to the blank file with your settings for the [host_ip_address] and [port_number] within the stratuxcot execution command:

```
[Unit]
Description=StratuxCoT Service
After=multi-user.target
# Requires=network-online.target multi-user.target
# After=network-online.target multi-user.target

[Service]
ExecStart=/usr/local/bin/stratuxcot -U tcp:[host_ip_address]:[port_number] -W ws://127.0.0.1/traffic
Restart=always
RestartSec=5

[Install]
WantedBy=multi-user.target
```

After saving and exiting the file, execute the following commands:

1. `sudo systemctl enable stratuxcot.service`

2. `sudo systemctl start stratuxcot.service`

3. `sudo systemctl status stratuxcot.service` (to confirm it is running correctly)

Alternatively, if you wish to stop the service, then type:
```
sudo systemctl status stratuxcot.service
```

Confirm ATAK Receiving the Stratux ADS-B Stream