Real-time NATS Flight Simulation for ADS-B Flight Data Feed

Automatic dependent surveillance—broadcast (ADS–B) is a surveillance technology in which an aircraft sends out position and state data, enabling it to be tracked. It broadcasts flight callsign, GPS location (latitude and longitude), current flight level, heading, and airspeed. ADS-B broadcasts data at a frequency of 1090 MHz.

NATS now has an interface to fetch this data and put it to use into pertinent use cases. The ADS-B FlightStick provided by RadarBox, connected to an antenna, is being used as a receiver. It is an Mode S RTL-SDR (https://www.rtl-sdr.com/tag/mode-s/) dongle that can be plugged in through USB. The setup is illustrated in the following image:

Once the hardware is plugged in, the next step is to install the necessary software that retrieves data. Dump1090 is a Mode S decoder specifically designed for RTL-SDR devices. NATS uses output by Dump1090 to propagate flights in real time.

Steps to install Dump1090:
Open a linux terminal and execute the following list of commands:

1. Set up Git and USB Dongle library:

```
sudo apt-get install git
sudo apt-get install cmake
sudo apt-get install libusb-1.0-0-dev
sudo apt-get install build-essential
```

2. Get RTL-SDR software from GitHub, install it, followed by testing for proper installation:

```
git clone git://git.osmocom.org/rtl-sdr.git
cd rtl-sdr
mkdir build
cd build
cmake ../ -DINSTALL_UDEV_RULES=ON
make
sudo make install
sudo ldconfig
cd ~
sudo cp ./rtl-sdr/rtl-sdr.rules /etc/udev/rules.d/
sudo reboot
rtl_test -t
```

3. Get Dump1090 from GitHub, and install it.

```
git clone git://github.com/MalcolmRobb/dump1090.git
cd dump1090
make
```

4. Add the following lines to the file '/etc/modprobe.d/raspi-blacklist.conf' and then reboot. If the file doesn't exist, it needs to be created.

```
blacklist dvb_usb_rtl28xxu
blacklist rtl2830
blacklist dvb_usb_v2
blacklist dvb_core
```
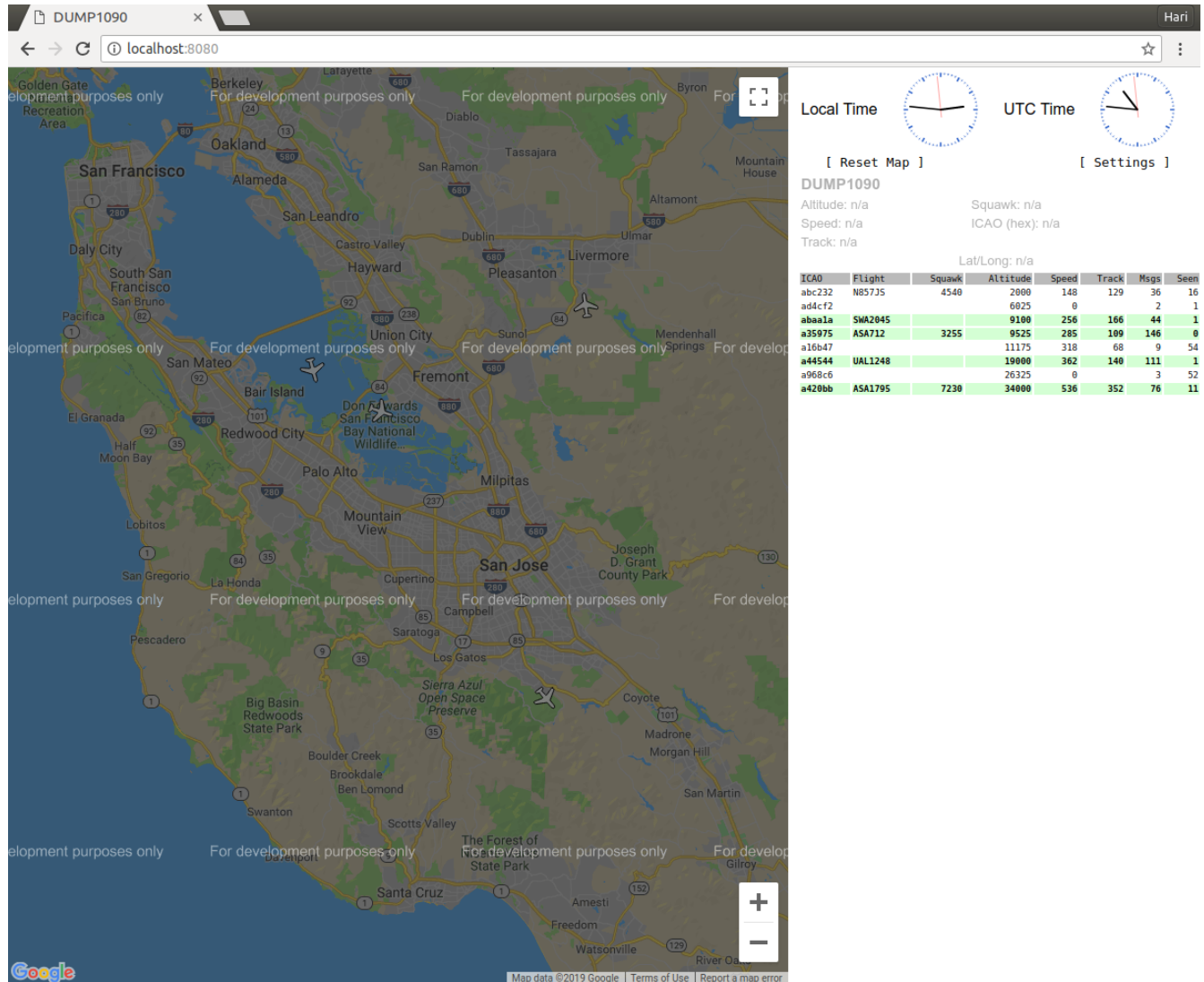
Run Dump1090 as:

```
./dump1090 --interactive -net
```

An example output for the command is as follows:

The "--net" argument while running Dump1090 enables networking over the port. Using this feature, the same textual output can be visualized with a Google Maps UI as provided by Dump1090.

The URL http://localhost:8080 provides the live flight positions on the map. A sample output of the browser this output on the browser:

The data fetched from using Dump1090 is being used by NATS Example program ADSBFlightSimulation.py. Running that module with NATS Server in the background would simulate flights in real time by dynamically inserting flights when they appear on ADS-B and eliminating them once they are gone. An output example of two flights that NATS Simulated in real time is shown below. This output was plotted using the output CSV after the simulation ran through.