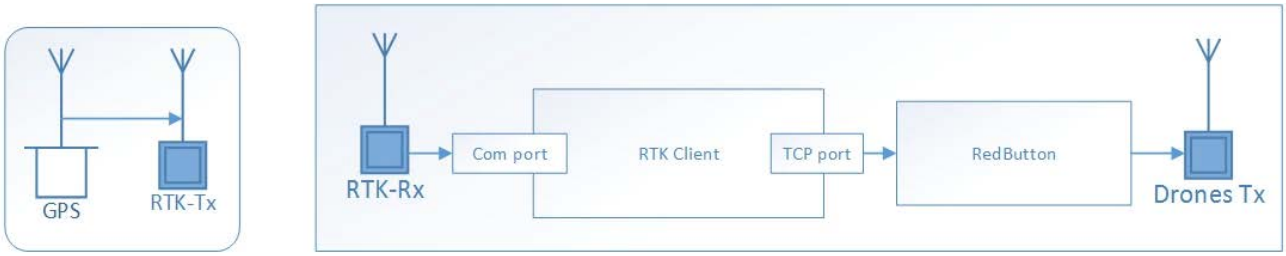
Secondary channel

During the drone show we can't guarantee strong Wi-Fi connection with all the drones. Even vehicles operate on their own mission, they still require RTK-GPS correction to be received and must response to emergency commands (like hold the mission execution, do land, return home or even disarm). Secondary channel was designed to reduce risks of leaving fleet uncontrollable

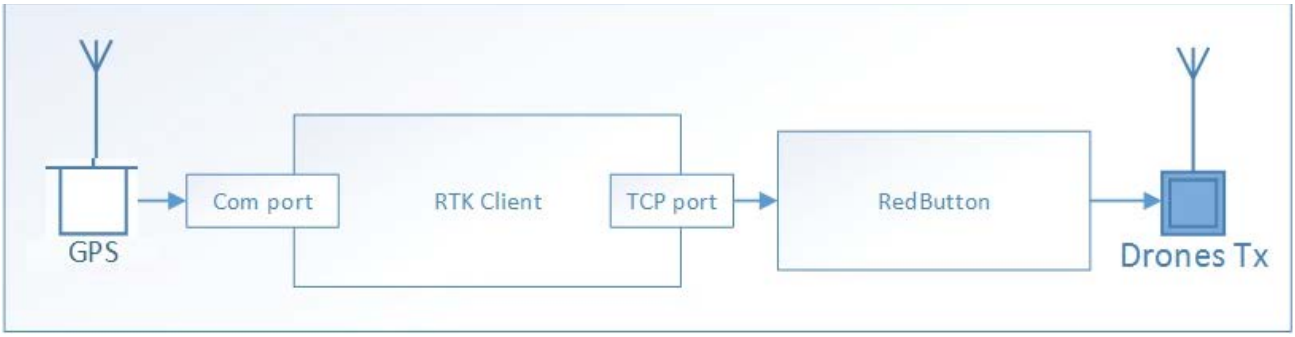
Architecture

Reading RTCM corrections through radio link



This case nicely fits when RTK Station should be located away from operators.

Direct connection:



Direct connection is good then high interference is expected.

Base GPS-RTK Station is running on its stationary location and sends its RTCM data to **RTK Client** application. **RTK Client** parses incoming packages, wraps them into Mavlink and retransmits them to consuming sinks. **Red Button** is responsible for sending commands to the swarm. Reads data from one of **RTK Client's** sinks and broadcasts packages through to the fleet.

Hardware

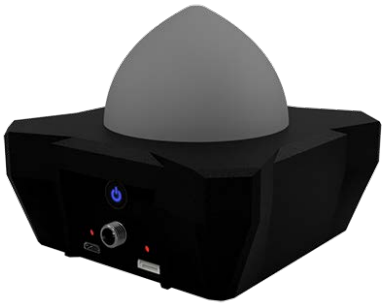
Radios

3DR radios has been chosen as a secondary channel link between drones and ground station. Depending on a region different band versions could be used to satisfy local requirements. (433, 868 or 915 MHz versions)

Be aware, default firmware doesn't support any encryption or channel securing. Communication can be hijacked.

Gps

U-blox NEO-M8P-2 chip based module is used as a base station. here

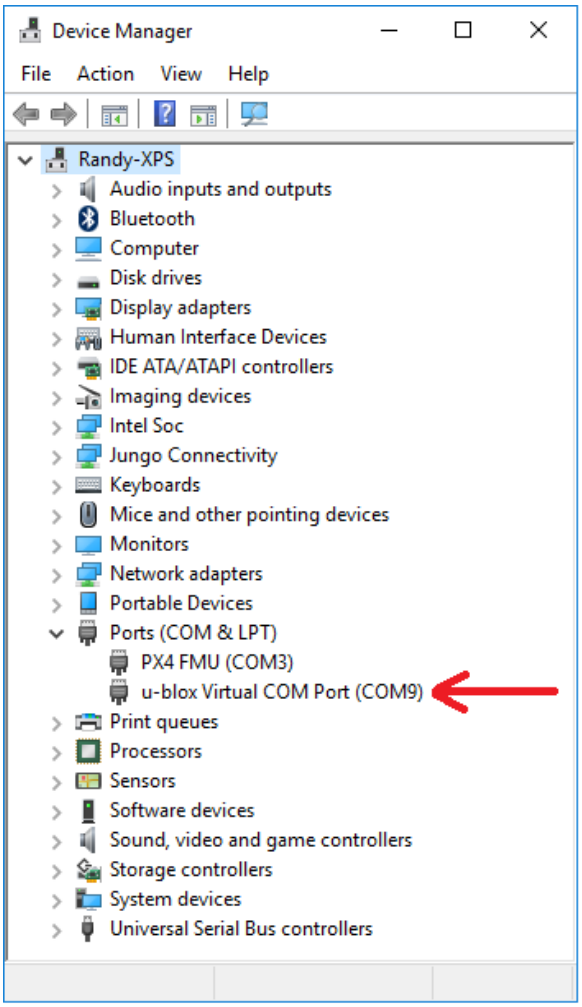


Base station can be connected and configured through USB locally or using radio modems remotely. RTKClient application suites perfect for such purpose.

Software

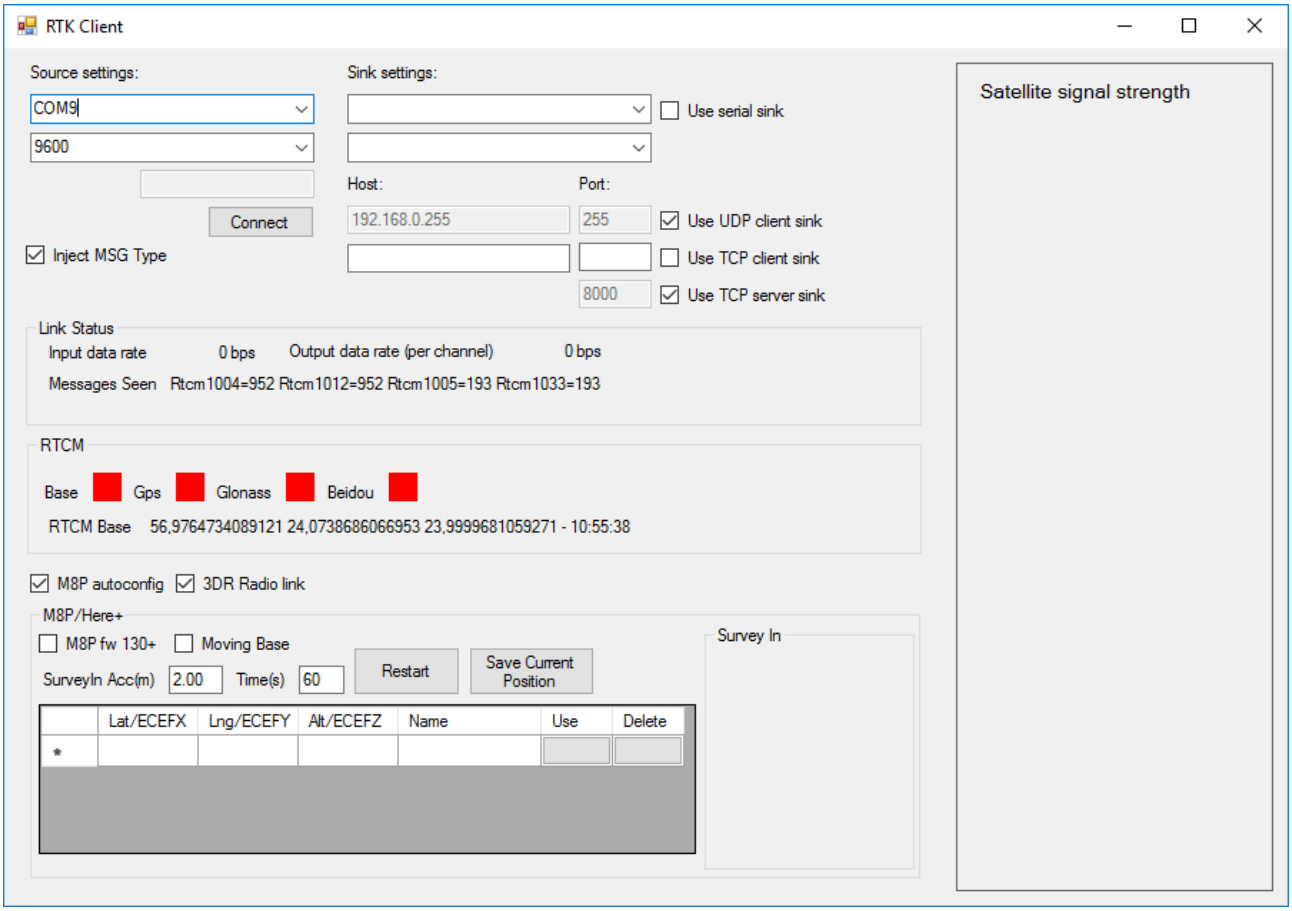
Installing the Drivers

Windows 10 users (and perhaps others) will need to download and install the u-blox GNSS Standard Driver for Windows, v1.2.0.8.
If this link is broken you may find a newer version is available under the “Driver” section of this ublox page.
When first installed, the device may show up in the “sensors” category in device manager. If this happens, please right click on it and “update driver” select “Browse my computer for driver software” then select “Let me pick from a list of devices” the next screen will show a list of possible drivers. Select.. “USB Serial Device” Select next and finish.
If installed correctly, when plugged in, the GPS should appear in the Device Manager as “USB Serial Device”.



RTK Client

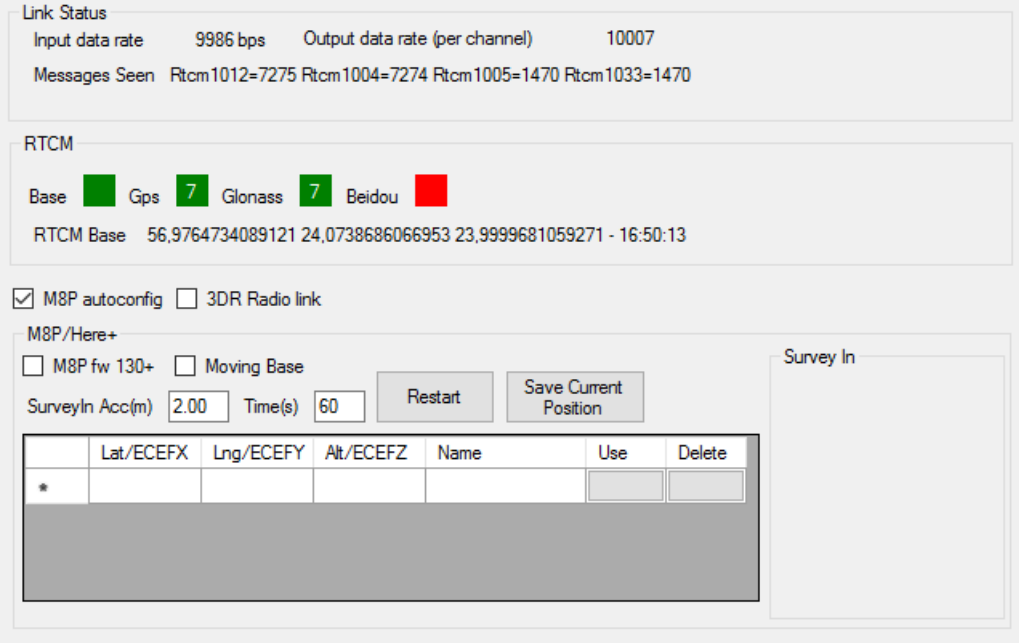
This tool was designed to configure, read corrections from RTK base station and retransmit data as a Mavlink messages to the multiple consumers.



Typical use case:

- Connect RTK Base station to your workstation.
- Identify COM port and baud rate used by GPS base. (9600 is default baud rate after gps restart) Refer to VCP Device driver manual (https://www.u-blox.com/en/product/u-center-windows)
- Choose port and speed in Source settings. (COM9 and 9600)
- Choose consumers sinks. Fill text fields and click check box:
    - UDP client (Broadcast UDP corrections to drones Wifi network.) (192.168.0.255 port: 14555)
    - TC client (Direct TCP connection to remote host)
    - TCP server port (Opens a server port and supplies RTCP corrections to external clients) (port :8000)
- Click “Connect”

If everything connected correctly, the following green box will be displayed.



If RTK base connected to the workstation using USB cable, then gps module will be automatically configured when **M8P autoconfig** check box is selected)
If RTK base connected with radio modems like 3DR Radios, then select 3DR Radio link option checked, so it will not try to reconfigure RTK-base to use higher speed. Only required messaged will be passed, so bandwidth and baud rate may remain relatively low.

In the SurveyIn Acc section, enter the absolute geographic accuracy that you expect your RTK base station to achieve. In the Time column, enter the minimum survey time you expect. Click on Restart, the ground station will transfer the data you have entered to the RTK base module, the base module will start a new round of surveying.
Survey In section will display : InProgress shows whether the survey is still ongoing. A completed survey of the current base position is indicated by the status messages SurveyIn Valid: True, and InProgress: false.
Duration: the duration of the survey in seconds
Obs: number of observations used for the survey
Acc: current accuracy in meters

- When the survey is completed as indicated by the SurveyIn: True message, you may click the 'Save current pos' button and enter a name for the saved position.
- The RTK messages from base station is sent to vehicle by Mavlink message through consumers sinks.

RedButton

This app is a supporting tool for the main DDC Client. Its main responsibility is to take control of individual drone or the whole fleet. It also sends RTCM corrections through emergency radio channel.

Main screen shows all drones in a fleet with buttons against each one. Broad cast command may be executed by clicking buttons at the bottom section.

Colored boxed right to the Number send a command to LEDs so you can change a color of particular drone. Easy to identify a problem one.

- D – Disarm (No confirmation, be carefull)
- L – Land
- R – Return Home
- Hold – pause drone from Mission execution if smth goes wrong.

RedButtonDDC.exe.config is a configuration file for RedButton application, Here are the most valuable settings:

```
<applicationSettings>
  <Drones.Properties.Settings>

    <setting name="BaudRate" serializeAs="String">
      <value>57600</value>
    </setting>
    <setting name="PortName" serializeAs="String">
      <value>com3</value>
    </setting>
    <setting name="ddcClientConfig" serializeAs="String">
      <value>c:\Program Files (x86)\UgCS\client-DDC\DDClient.exe.config</value>
    </setting>
    <setting name="RtcmSourceHost" serializeAs="String">
      <value>localhost</value>
    </setting>
    <setting name="RtcmSourcePort" serializeAs="String">
      <value>8000</value>
    </setting>
  </Drones.Properties.Settings>
</applicationSettings>
</configuration>
```

- BaudRate – baudrate for Radio link used to send commands to drones fleet

- PortNumber – com port where there Radio link is detected.
- ddcClientConfig - path to DDC Client config file. RedButton uses it to retreave a list of detected vehicles
- RtcmSourceHost – host where RTK Clinet opening its server port and supplies packed rtcm corrections.
- RtcnSourcePort - port number at RTK Clinet to read rtcm corrections.