GPS Expansion

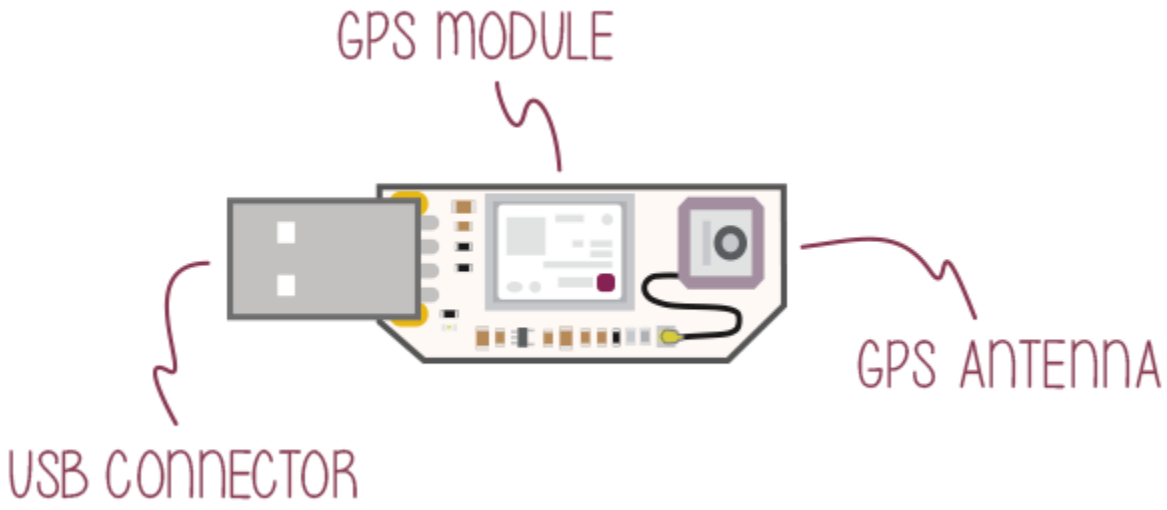
The GPS Expansion for the is a USB-based expansion that allows your Omega to pinpoint its location using both GPS as well as China's Beidou satellite positioning systems. It comes with an on-board GPS antenna as well as a built-in u.FL connector to attach your own antenna. It features:

- 1.8m accuracy
- 66 search channels
- 22 tracking channels
- -165 dBM sensitivity
- up to 10Hz update rate.

The Hardware

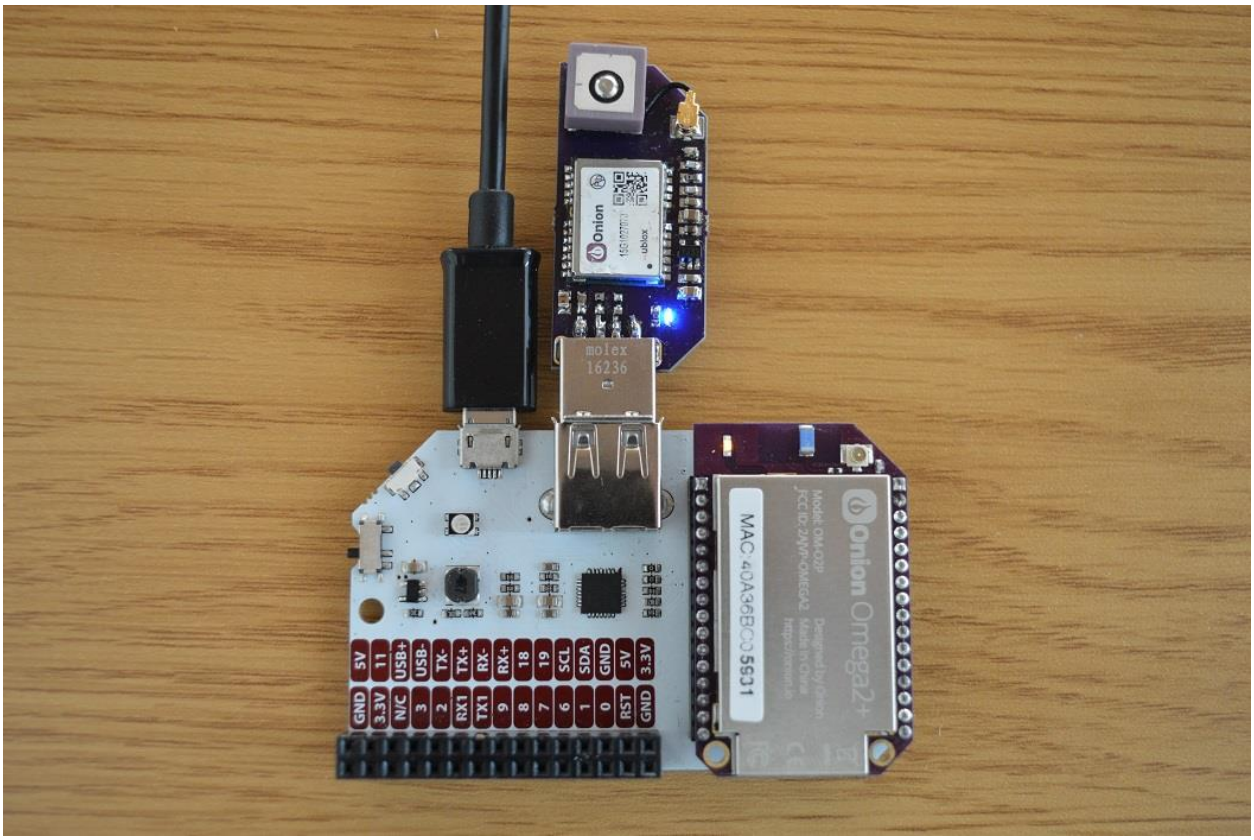
The GPS Expansion uses a u-blox GPS receiver which features a high performance u-blox 6 positioning engine. This chip sends the GPS data to the Omega via the USB connection. Simply plug in your GPS expansion into a Dock to get started.

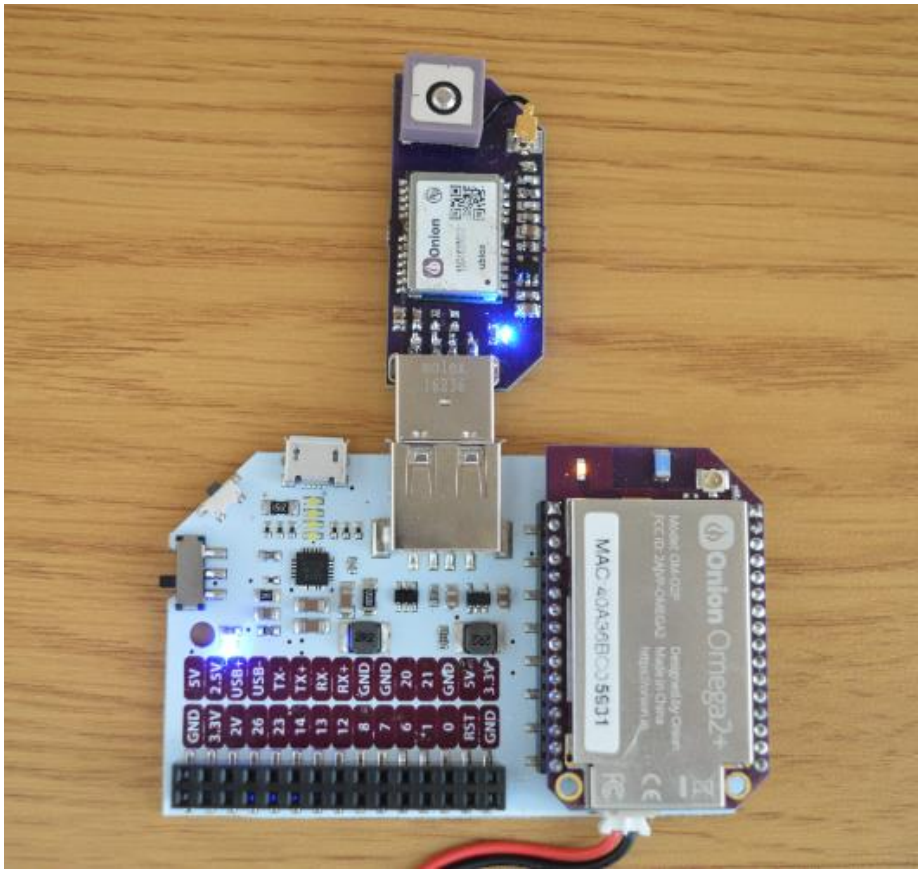
You can even change the antenna by disconnecting the included antenna and connecting your own to the onboard u.FL connector.

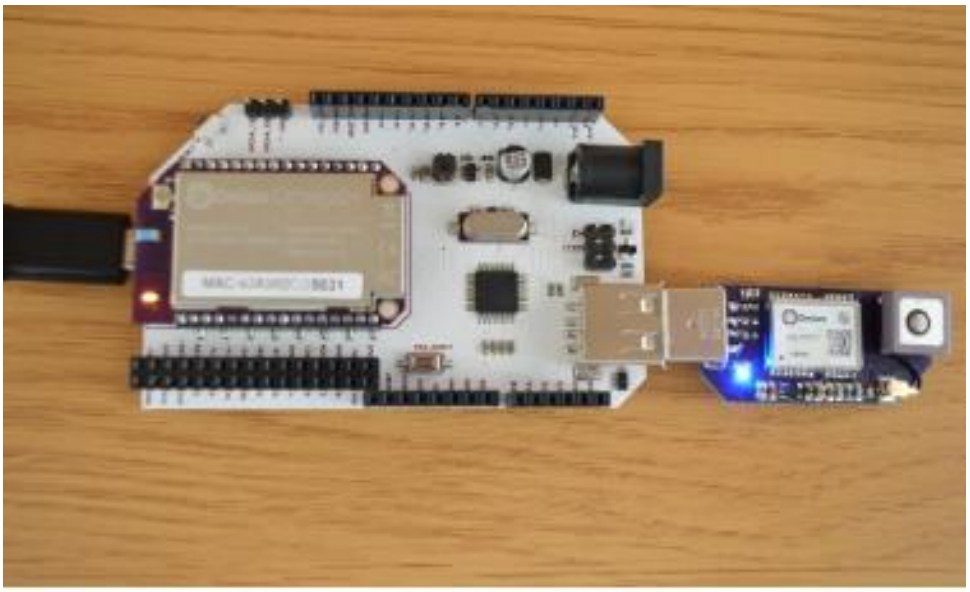


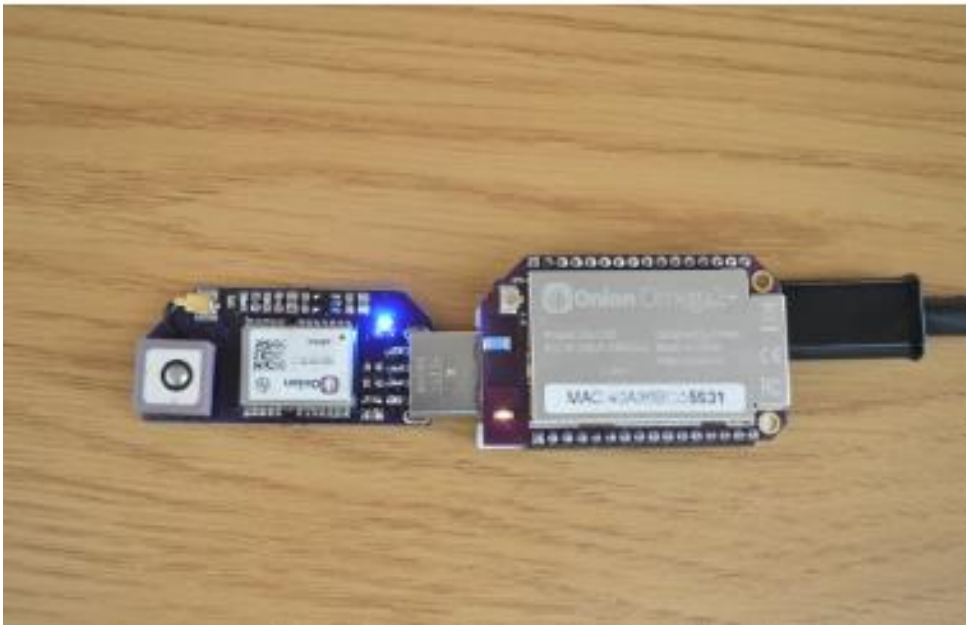
Connecting to a Dock

The GPS Expansion plugs into a Dock with a USB port. You can also connect a USB hub to a Dock's USB port and connect the GPS Expansion into the hub.


Onion
molex
16236
MAC 40A36BC05931
Onion Omega2+
5V 11 USB+ USB- TX- TX+ RX- RX+ 18 19 SCL SDA GND 5V 3.3V
GND 3.3V N/C 3 2 RX1 TX1 9 8 7 6 1 0 RST GND


Onion
MAC 40A36BC05931
Onion Omega2+
5V 2.5V USB+ USB- TX- TX+ RX- RX+ GND GND 20 21 GND 5V 3.3V
GND 3.3V 2V 26 23 14 13 12 8 7 6 1 0 RST GND





This is one of the few Expansions that doesn't require Expansion headers, so you can even use it with the Mini Dock if you'd like!

The ublox Chip and Antenna

The ublox chip used on the GPS expansion is the **ublox NEO-6M**. This chip translates the information received from the antenna into NMEA messages that the Omega can understand.

NMEA is the National Marine Electronics Association protocol. If you're interested in marine electronics you can read the Wikipedia article on the latest NMEA protocol.

For more on the ublox chip, see the ublox chip datasheet.

USB Connector

The USB connector serves two purposes. By plugging the Expansion into a Dock's USB port we power the GPS Expansion, and we provide a means of communication between the Omega and the Expansion.

Using the GPS Expansion

You can use the GPS Expansion to create some cool geo-data projects with your Omega! For example, you can try your hand at creating a navigation system using the GPS Expansion with the OLED Expansion. Or for a simpler project, you can create a treasure hunt game that alerts the user when they're in the vicinity of an item for a children's party.

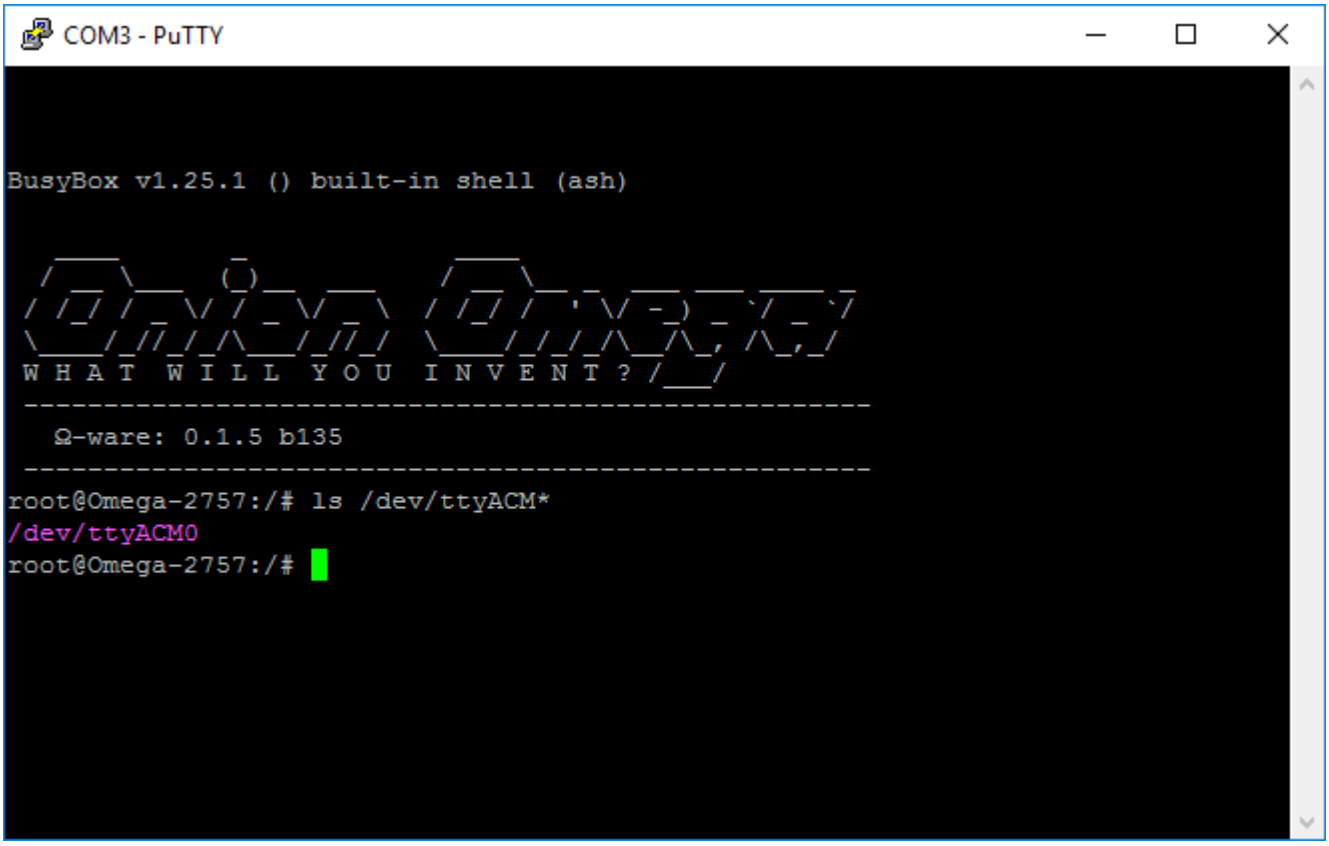
Using the GPS Expansion

The GPS expansion from Onion features a ublox neo GPS module, which allows seamless integration into your Omega projects. This Expansion outputs GPS data in the form of NMEA messages, which include all relevant information (latitude, longtitude, etc). We have prepared a package called `ogps` to handle the NMEA messages and offer up the relevant information to the user via `ubus` calls in the command-line.
You can learn more about the technical specifications of the GPS expansion in our GPS Expansion hardware overview

Reading the Raw Output of the GPS Expansion

The device driver will already be installed and Linux should recognize the device automatically. To double check, run the following command.

```
ls /dev/ttyACM*
```

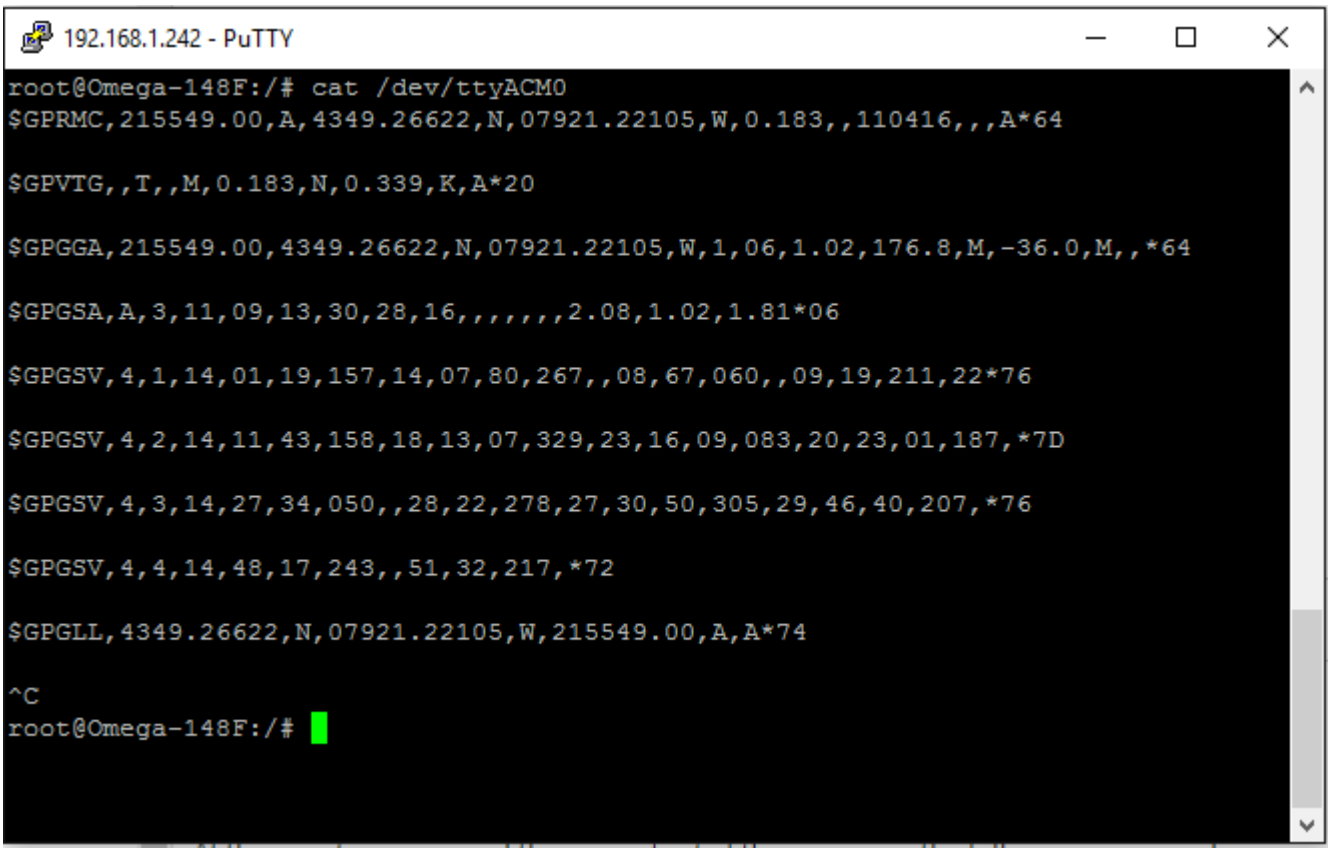


You should see a device called “ttyACM0”. This is our GPS expansion.

At this point you can read the raw output of the GPS using `cat`:

```
cat /dev/ttyACM0
```

And you’ll see something that looks like the following:

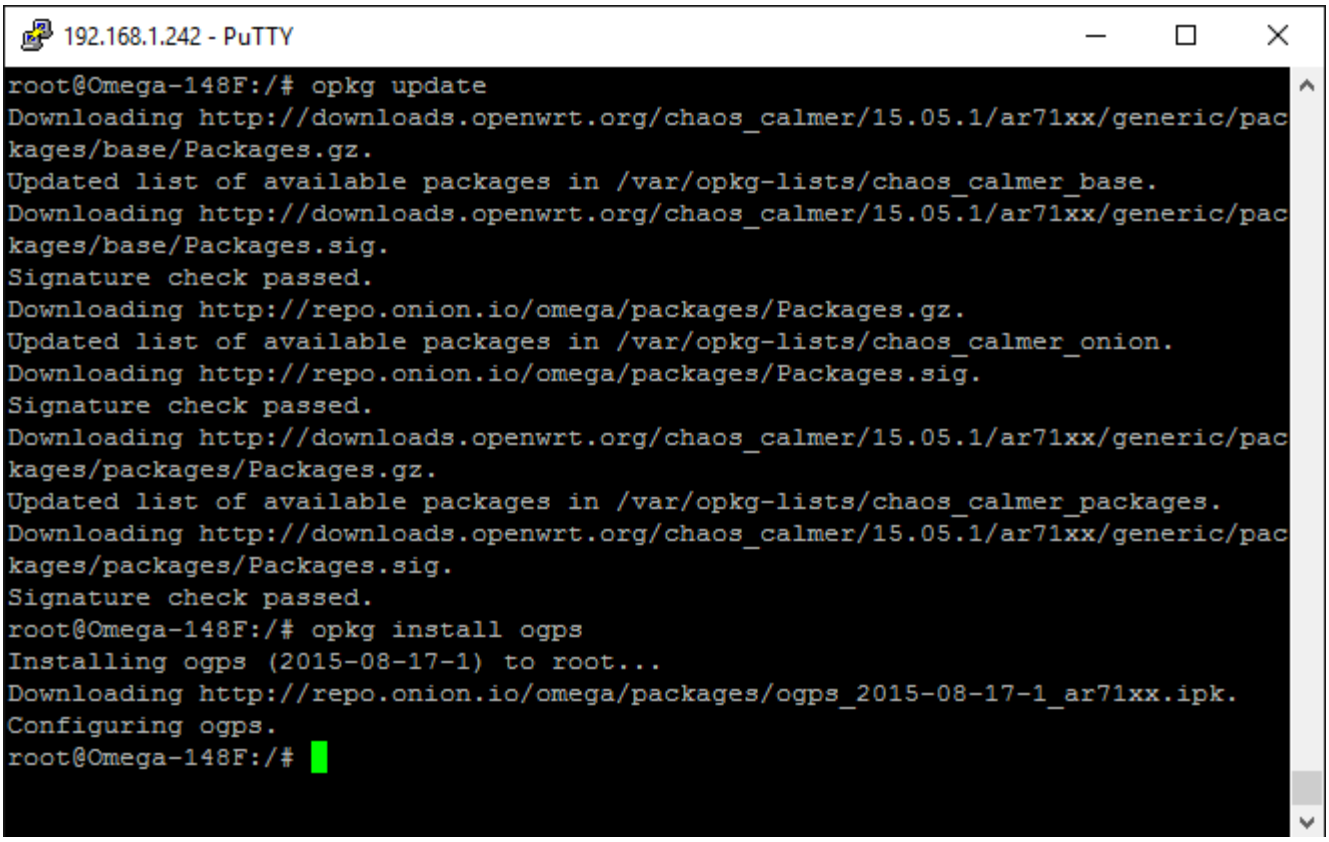


This is the NMEA output, and it's quite hard to read. Luckily we've got a utility that will translate this data into useful information.

Reading NMEA Data Using `ogps`

You can also use `ogps` to access relevant data offered up by the GPS via `ubus` calls. To install `ogps` enter the following commands.

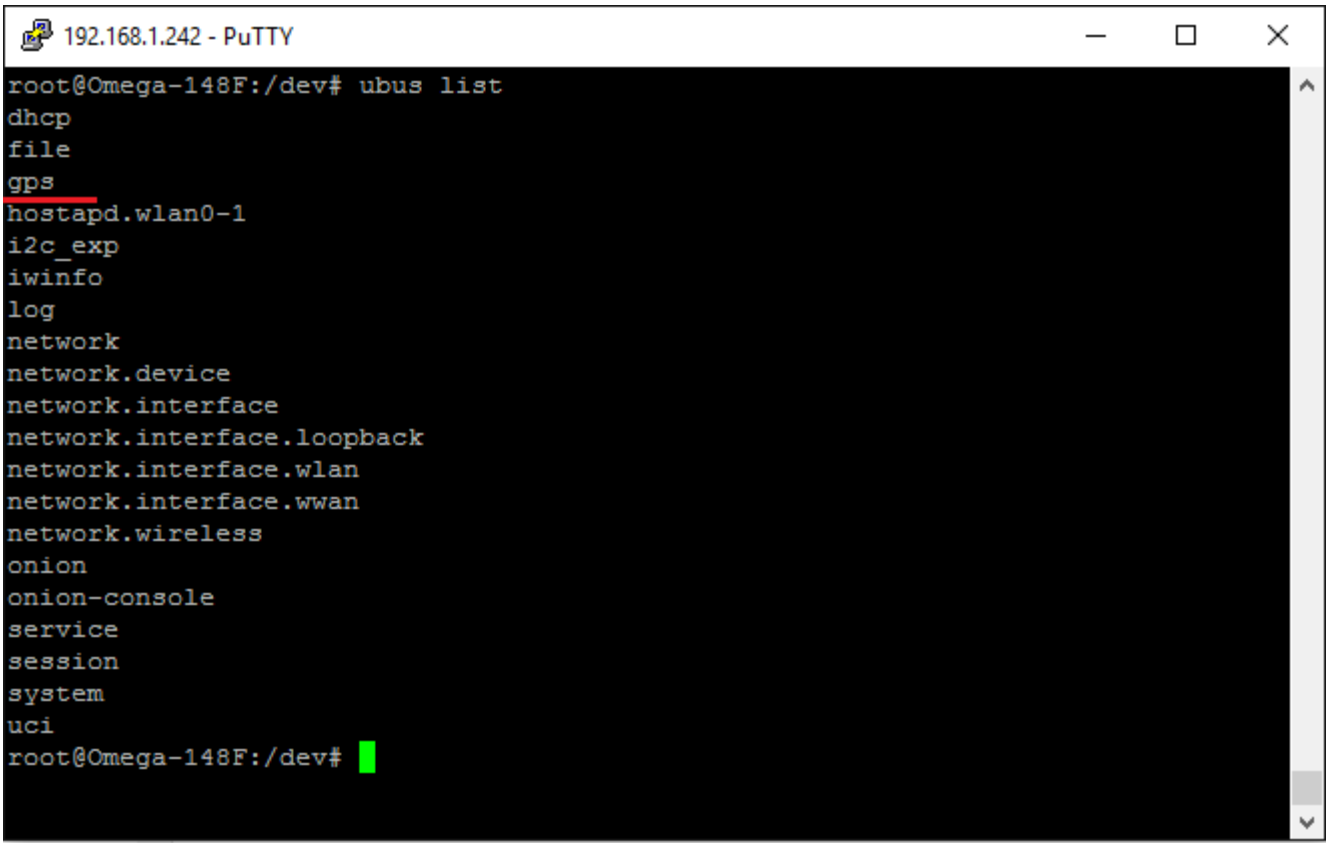
```
opkg update
opkg install ogps
```



You can now access the GPS information through `ubus`. To make sure the `gps` service has initialized, run the following command, which will list all the available `ubus` services:

```
ubus list
```

You should see the `gps` service listed:



If you don't see `gps` listed, you'll need to restart your `rpcd` service in order to refresh the list:

```
/etc/init.d/rpcd restart
```

If this doesn't work, try reinstalling the `ogps` package by running the following commands:

```
opkg remove ogps
opkg update
opkg install ogps
```

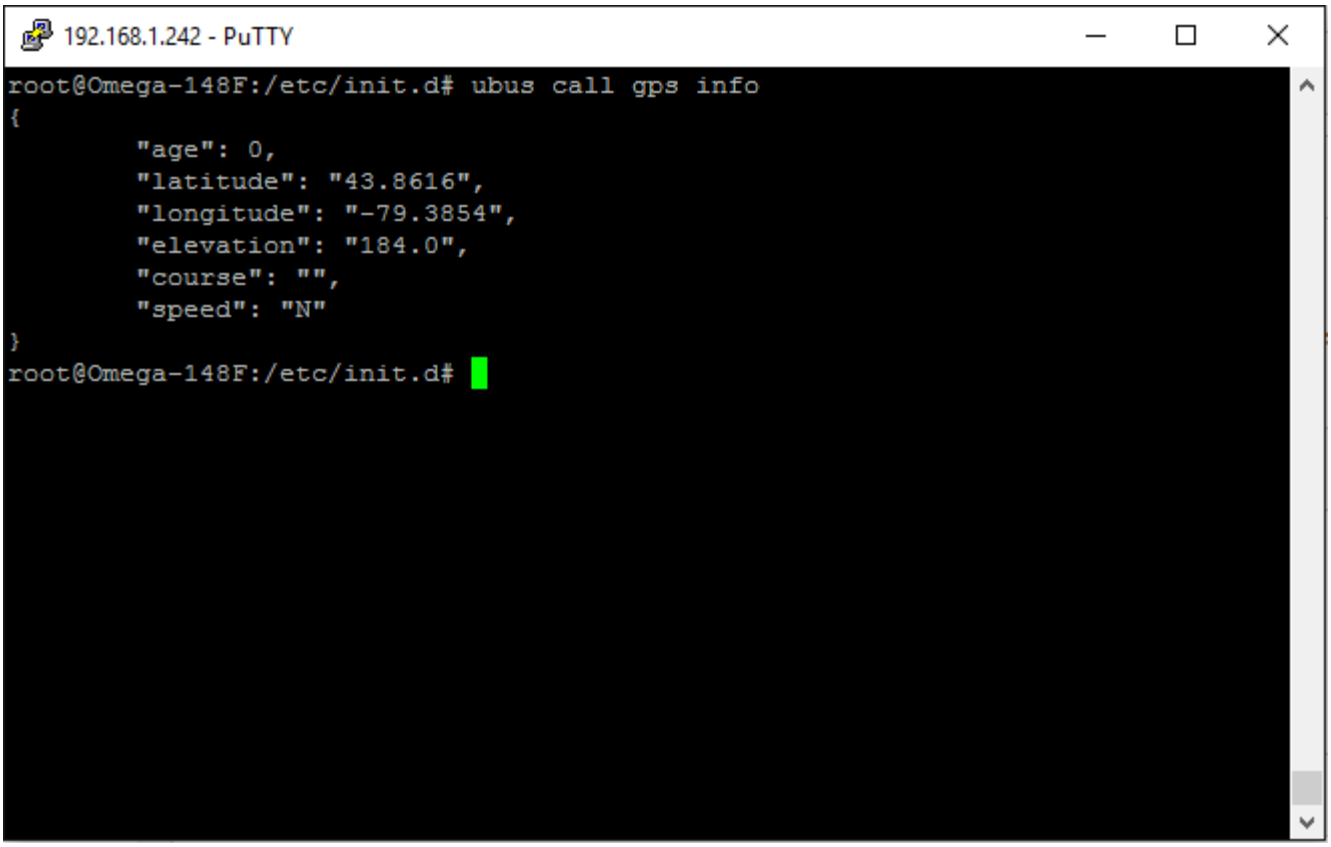
Usage

First, make sure your GPS Expansion is connected! Then, to access the data you'll need to `call` the correct service with the following command:

```
ubus call gps info
```

If the GPS is not locked, the command will return `signal=false`. In this case you may need to give the GPS more time to lock onto a satellite; try it again after 10 seconds. If this still doesn't work, you will need to move to a more open area where the GPS Expansion can see more satellites.
You may need to go outside in order to lock the GPS signal.

Otherwise you should have an output that looks like this.



Note: If you've used the GPS Expansion with the Omega1, you may remember some hardware stability issues regarding the GPS Expansion. This is no longer the case with the Omega2 and Omega2+.