Peter Mount's Blog

Java, XMPP, Space and pretty much everything else

JUN 18 2012

109 COMMENTS
BY PETERMOUNT1 ASTRONOMY, DEBIAN, GPS, RASPBERRY PI, WEATHER

Getting GPS to work on a Raspberry PI

One of the tasks I want to use a Raspberry PI for is to take over the duties of an existing ITX based linux box running my weather station (http://maidstoneweather.com). Now in theory that should be pretty simple as the current setup uses pywws (http://code.google.com/p/pywws/) to connect to the station and as that's written in python it should work.

Now the Raspberry PI has no onboard Real time clock (http://en.wikipedia.org/wiki/Real-time_clock) – which means it needs to use an NTP server (http://ntp.org/) to get the time when it starts. Usually you would use the default settings and allow the PI to connect to thenet for it's time. Now this is fine if you have a working net connection but what if you are not connected to the net? You might be in the field running the PI on batteries.

As the other projects I have lined up for it is to connect my Meade LX200GPS telescope to the local network or to work with my (in prototype) radio telescopes so having an accurate clock is going to be required.

Now the obvious solution here is to use GPS (http://en.wikipedia.org/wiki/Global_Positioning_System) as a time source. GPS works by having a constellation of satellites in orbit and each one carries a highly accurate atomic clock & broadcast both their current position and the time. A GPS receiver (http://en.wikipedia.org/wiki/GPS_navigation_device) then receives these signals and, as long as it has enough satellites and workout where you are by comparing the times from those clocks.

So this article shows how to use A GPS receiver with the Rasperry PI – although these instructions are not specific to the PI.

The hardware

For this experiment I'm using a USB GPS receiver from Maplin – product code A73KF (http://www.maplin.co.uk/usb-gps-dongle-476503). I bought this several months ago when they had it on special offer for £19.99 – it usually retails for £29.99.

(http://reteporg.files.wordpress.com/2012/06/imag0148.jpg)

Raspberry PI with the A73KF GPS receiver plugged in

Now it comes with a CD for Windows machines but we don't need it – as the majority of GPS receivers I know of use serial & this is no exception. When plugged in it appears as a serial port.

Plug it in and run lsusb

```
1  pi@raspberrypi:~$ sudo lsusb
2  Bus 001 Device 003: ID 0424:ec00 Standard Microsystems Corp.
3  Bus 001 Device 004: ID 067b:2303 Prolific Technology, Inc. PL2303 Serial Port
4  Bus 001 Device 002: ID 0424:9512 Standard Microsystems Corp.
5  Bus 001 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
```

There the Prolific Technology entry is the GPS appearing as a serial port. If you look in /var/log/syslog you will also notice it will have created the port as /dev/ttyUSB0 as it's the first serial port.

Using the PI as a GPS Receiver

Now the next step is to get the pi receiving data from the satellites. Now there is a suite of tools available for Linux called gpsd (http://www.catb.org/gpsd/) which we'll install:

```
1  pi@raspberrypi:~$ sudo apt-get install gpsd gpsd-clients python-gps
```

Next we need to start the daemon:

```
1  pi@raspberrypi:~$ sudo gpsd /dev/ttyUSB0 -F /var/run/gpsd.sock
```

Ignore any messages from the console or in the log files, you may see it complaining about IPv6 but you can ignore that.

Viewing whats in the sky & your location

Now GPS doesn't work indoors – as it needs a clear view of the sky so for this I've placed the PI on the window sill. Next I ssh into the pi and run cgps.

```
1  pi@raspberrypi:~$ cgps -s
```

The -s flag is there to tell the command not to write raw data to the screen as well as the processed data.

You should then get the following output:

```
   Time:         2012-06-18T15:05:10.0Z    PRN:   Elev:   Azim:   SNR:   Used:
   Latitude:      51.231848 N               14     43      249     40      Y
   Longitude:      0.514014 E               25     75      283     37      Y
   Altitude:     132.3 m                     2     26      085     31      Y
   Speed:        0.0 kph                    12     56      070     18      Y
   Heading:      0.0 deg (true)              9     19      133     22      Y
   Climb:        0.0 m/min                  27     09      133     17      Y
   Status:       3D FIX (1 secs)             4     17      045     31      Y
   GPS Type:                                32     05      321     20      Y
   Longitude Err:   +/- 8 m                 29     41      192     18      Y
   Latitude Err:    +/- 9 m                 31     28      304     42      Y
   Altitude Err:    +/- 27 m
   Course Err:      n/a
   Speed Err:       +/- 68 kph
```

Here you can see it's receiving from 10 satellites and it has the time and your location. The 3D FIX section tells you it has enough data for a 3D fix on your location (i.e. altitude). The Err lines tell you the error in your position. If you leave it running you should see the Err values change every second or so.

Viewing GPS under X-Windows

Now above I showed how the GPS looks from an SSH connection but you can get a graphical display as well using the xgps client thats also been installed. Now if you have a monitor connected to the pi simply open a terminal and run xgps. However as I've not got a monitor against the window I've used ssh to connect to it from another machine. To get this to work you need to add -Y to the ssh command.

```
1  peter@somehost:~ $ ssh -Y pi@raspberrypi
2  pi@raspberrypi:~$ xgps
```

You should now get a window like the following open on your local machine – don't worry if it takes a little while, it might take a second or two:

(http://reteporg.files.wordpress.com/2012/06/xgps.png)
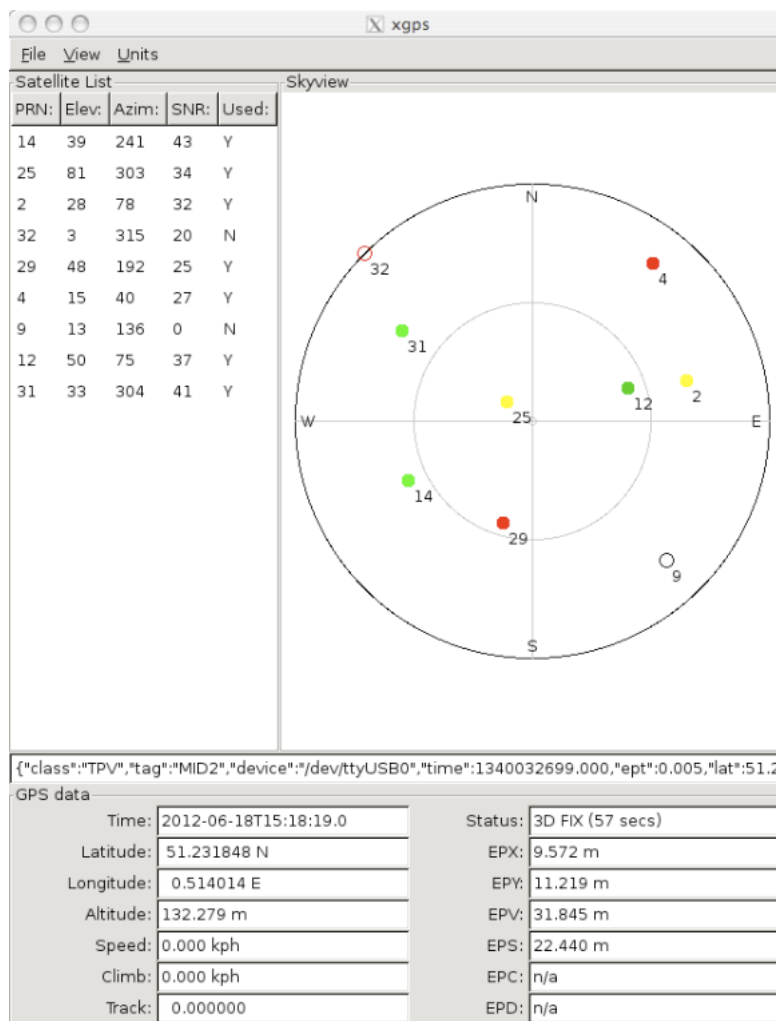
xgps running on a PI but being displayed on Mac OS-X

Setting the computer time using GPS

Now we have a working GPS we can now get the PI to use it for setting the time. To do this we need to configure ntp to use the GPS satellites as a time source. Now you should already have ntp installed but if not then you need to install it:

```
1   pi@raspberrypi:~$ sudo apt-get install ntp
```

Next you need to edit the file: /etc/ntp.conf and add a few lines to it defining the GPS. This can be either before or after the existing lines beginning with server:

```
1   # gps ntp
2   server 127.127.28.0 minpoll 4
3   fudge  127.127.28.0 time1 0.183 refid NMEA
4   server 127.127.28.1 minpoll 4 prefer
5   fudge  127.127.28.1 refid PPS
```

Now restart ntp:

```
1   pi@raspberrypi:~$ sudo service ntp restart
```

Now if you query the server you should after a while see it synchronize:

```
1   pi@raspberrypi:~$ ntpq -p
2   remote           refid      st t when poll reach   delay   offset  jitter
3   ==============================================================================
4   *ns1.luns.net.uk 33.117.170.50   2 u   54   64     7  65.454    2.666   5.800
5   +resntp-b-vip.lo 127.151.91.34   3 u   45   64    17  55.704   -5.169   8.482
6   +bart.nexellent. 194.242.34.149  2 u   17   64    17  76.585   -4.271  57.595
7   +v01.s01.be.it2g 193.190.230.65  2 u   20   64    37  86.464   -2.374 228.460
8   xSHM(0)          .NMEA.          0 l   11   16   377   0.000  144.714   3.026
9   SHM(1)           .PPS.           0 l    -   16     0   0.000    0.000   0.000
```

A couple of notes:

You might find that ntp doesn't connect to the gps at first. It appears that it starts gpsd up without the link to the serial port. What I find I have to do is:

```
1  pi@raspberrypi:~$ sudo killall gpsd
2  pi@raspberrypi:~$ sudo gpsd /dev/ttyUSB0 -F /var/run/gpsd.sock
3  pi@raspberrypi:~$ sudo service ntp restart
```

Once I've done this then after it gets a fix then it starts working. Sometimes running cgps and waiting for it to get a fix also fixes this.

I don't know why this happens but it's an issue I've yet to solve.

Tagged   BBC, General Purpose Input/Output, Global Positioning System, GPS, Linux, Operating Systems, Raspberry PI, YouTube

109 thoughts on "Getting GPS to work on a Raspberry PI"

Michael Brevig says:

June 18, 2012 at 10:32 pm

Great Post!

I can't wait to try this out myself.

Reply

Iain Dobson says:

June 21, 2012 at 9:48 am

Hi, great post thanks. Your using a GPS receiver – can you suggest any products that send and receive?

Reply

petermount1 says:

June 21, 2012 at 9:56 am

With GPS there are only receivers – the transmitters being in orbit 🙂

Are you thinking of WiFi or BlueTooth instead?

Reply

Simon Kuhn says:

July 17, 2012 at 10:40 am

I am currently developing for ST-22 GPS module attached via UART. Should work the same way (using /dev/ttyAMA0), but unfortunately gpsd doesn't support the Skytraq binary protocol, which i need to edit some config. But I can switch to NMEA after configuring, so it should work just fine.
This module is small (2cmx2cm) and lightweight (9 gr), cheap (20€) and energy-efficient (~50mA@5V) and it can be directly attached to Pi without any TTL voltage changes.
I'll report if I get it up and running.

Reply

petermount1 says:

July 17, 2012 at 10:50 am

Thanks yes it would be interesting as I have noticed that there are some cheap modules around. Not sure if it's the same module but did see one for less than £10 a few weeks ago.

One tip, the gpio lines on the pi is 3v3 not 5v TTL but I've not yet got around to that side of things yet.

Reply

Simon Kuhn says:

July 17, 2012 at 9:54 pm

Thats the nice thing about this module: Vcc is best for Pi (5V), but logic levels are 3,3V (at least it says HIGH=min. 2,9V)
Some other modules I found had a rather high power consumption or a much higher price. A £10 module would be great anyway!

Stevie says:

July 17, 2012 at 6:22 pm

Great Post! But i'm having a slight issue. I'm using that exact same gps receiver as you on a raspberry pi. However, I can't get any of the gpsd clients to work, they all report "NO FIX". If I use gpscat the coordinates are displayed. The blue LED light is flashing.

Why might this be?

Reply

Stevie says:

July 17, 2012 at 6:38 pm

completely ignore this. I just killed it and restarted. now works a treat!

Cheers again

Reply

petermount1 says:

<u>July 17, 2012 at 7:01 pm</u>

Ok, I was going to take a look when I got home.

It sounds like a similar issue I mentioned at the end of the article. I've still not figured that one out yet.

Ginger Bill says:

<u>July 21, 2012 at 6:01 pm</u>

It is possible to gather the data from the GPS unit to be used in my own software? Such as make a program that displays only height and speed etc. ?

Reply

xplane80 says:

<u>July 21, 2012 at 6:03 pm</u>

Is it possible to use the data from the USB unit to be used my own software such as use the height and co-ordinates?

Reply

petermount1 says:

<u>July 21, 2012 at 10:08 pm</u>

yes you can. All that xgps or cgps does is read from the receiver. The receiver simply appears to the pi as a serial port so your own software simply needs to connect to the port & read from it.

Although I've not used it myself (yet) there is a python library for doing this (it's installed as part of this article) but parsing standard nmea strings isn't that difficult either – I did that once about 10 years ago in java.

Reply

snarkbe says:

<u>August 9, 2012 at 11:56 am</u>

Small command error at the "Now restart ntp:" step. You're reinstalling it 🙂 . Great article.

Reply

petermount1 says:

<u>August 9, 2012 at 11:58 am</u>

Whoops, your the first to spot that, now fixed 🙂

Reply

Nate Lockwood says:

<u>August 11, 2012 at 9:33 pm</u>

I was just joking with a friend that a NTS server could not only be made with any old computer that could take a GPS but probably even a Raspberry-PI; then I used Google searching on Raspberry-Pi UPS & GPS. Wow!

Is the time available to a millisecond or less? What OS do you have on your Pi?

Reply

petermount1 says:

<u>August 12, 2012 at 7:33 am</u>

First when I wrote that article it was the original debian flash image but I'm now using raspian but it should work fine as is.

As for millisecond or less, the gps receiver used is a standard consumer unit which appears as a serial port to the pi so it's limited by that so it wont be that accurate but close.

Saying that it is possible to get that resolution & the pi comes into its own here as you can get gps receivers in component form which you could build a unit for under £15. On ebay theres a UK seller (Brighton) selling some gps receiver chips for £5. These chips support SPI so you can get the pi to talk directly with the receiver. With that and a little programming you could then get millisecond accuracy.

Reply

Nate Lockwood says:

<u>November 9, 2012 at 11:55 pm</u>

Thanks, I'm in the US and my PI has not yet been shipped. I bought a Globalsat BU353 which I managed to get working on my macAIr under Mountain Lion with Globalsat's driver – inside my house! Today I got it working on a work HP notebook that I have "repurposed" to Ubuntu 10.10. It was a snap following your directions to get it working (after I took it outside).

Simon Kuhn says:

<u>August 12, 2012 at 2:08 pm</u>

Acording to data sheet, my GPS module gives a signal with 0,3μs accuracy on one pin ("1PPS"). We could just use this signal and ignore the normal GPS data (after we read out the time once). So I think the Pi should be able to achieve <1ms…

Reply

Chris says:

<u>October 6, 2012 at 2:18 am</u>

Yes, exactly, you'll need to break out the pps signal so your ntpd can be told via gpsd when the second changes. Otherwise it could be any time within a fairly large window which can vary quite a bit because of other things happening on the USB. Perhaps you could use one of the gpios on the raspberrypi – as peter says thats the way to go.

Simon Kuhn says:

October 9, 2012 at 10:43 am

Unfortunately, I somehow killed my GPS device before I could get any useful results, so this is paused until I can afford a new one.
I used a connector for parallel port on ATX mainboards and soldered the needed pins to the GPS device, because this connector had exactly 13×2 pins. I just took a random GPIO pin and connected it to 1PPS for later use. Until I get this to work I'll just use the time given in the NMEA packages.
I think I have a rather small delay, because I'm not using any USB devices and even plan to deactivate the USB/LAN chip to save some more energy.

Tony Darby says:

August 13, 2012 at 12:23 am

I have same module from Maplin and have tried all your steps. It all works up until the ntpq results. Its just not getting data from the gpsd side I think. Tried restarting gpsd and ntp etc and tried wheezy and Adafruits distro, both give same results. Still its kept me busy for a Sunday evening.

Reply

petermount1 says:

August 13, 2012 at 8:49 am

Did you try to get a gps fix first?

I remember having to run cgps briefly until it got a fix then it worked.

The article was done on wheezy but I'm going to redo it on raspian soon – don't see any reason it wont work.

Reply

Tony Darby says:

August 14, 2012 at 6:53 pm

Yes gps fix side works fine, it would make a nice gps display/logger.
I assume the problem lies in ntp getting the data from the shared memory port.
I have a serial gps with a 1pps output somewhere and when I find it will try that on the gpio port.

Reply

pkennedy20Paul Kennedy says:

August 18, 2012 at 3:06 am

hi
great article. how stable does NTP report this to be as a reference clock? I can see you have added a fudge factor of 183 milliseconds in an attempt to line the source up with internet sources. I guess the dongle outputs the serial data somewhat late, which is not a problem in itself, but the stability of that latency is critical. the would you have any thoughts on how stable this really is? my guess is the dongle will have hiccups when constellations change, causing delays in the nmea output, which in turn make ntp somewhat unstable.
I am yet to get my hands on my pi, but cant wait to give this a spin

Reply

Anthony Mills says:

August 20, 2012 at 4:55 am

Awesome post thanks, mate. Just recieved my GPS dongle in the mail today so cannot wait to try it out with my RaspberryPi.

Reply

Ben and Becks Adventures says:

August 21, 2012 at 9:41 pm

Awesome post and had me up and running very quickly. One question: I need to run the 3 reset commands after I boot the Pi. I'm very new to Linux and I'd like to add these commands to a startup script. I think I need to create the script in /etc/init.d/ folder. I need the script to run after the daemon for gpsd has been initialised, but where do I find the boot order? In old school windows/DOS it would be something like autoexec.bat.

Reply

djpras says:

August 23, 2012 at 4:34 am

nice.. but i newbie.. what are the requirements to build gps on a raspberry.. ??

appreciate your answer… 🙂

Reply

15. *Getting GPS to work on a Raspberry Pi #piday #raspberrypi @Raspberry_Pi « adafruit industries blog* says:
August 31, 2012 at 4:00 am
[…] Getting GPS to work on a Raspberry Pi. Peter writes – One of the tasks I want to use a Raspberry PI for is to take over the duties of an existing ITX based linux box running my weather station. Now in theory that should be pretty simple as the current setup uses pywws to connect to the station and as that's written in python it should work. […]

Reply

Bj says:

September 10, 2012 at 2:24 pm

Thankyou for the walkthorugh, I got mine working no worries, just a tip, run a script on startup to call /etc/init.d/startup.sh with "gpsd /dev/ttyUSB0 -F /var/run/gpsd.sock" in it and it works first time everytime 😊 Keep up the good work! Cheers Bj

Reply

szekla says:

September 22, 2012 at 4:21 pm

Hello Peter,
I am using Holux M 215 gps (10c4:ea60 Cygnal Integrated Products, Inc. CP210x Composite Device)

when I run cgps -s, I get GPS timeout message.\
since my gps shows up as /dev/gps0 I have tried to change to
sudo gpsd /dev/gps0 -F /var/run/gpsd.sock
but no result either.
any ideas what could be wrong?
thanks
Szekla

  Reply

Charles Linquist says:

October 9, 2012 at 2:01 am

Oct 8 18:52:43 raspberrypi gpsd[315]: gpsd:ERROR: /dev/ttyUSB0: device activation failed.
Oct 8 18:52:43 raspberrypi gpsd[315]: gpsd:ERROR: device open failed: Permission denied – retrying read-only
Oct 8 18:52:43 raspberrypi gpsd[315]: gpsd:ERROR: read-only device open failed: Permission denied
Oct 8 18:52:43 raspberrypi gpsd[315]: gpsd:ERROR: /dev/ttyUSB0: device activation failed.

I get the above.

And when I type 'lsusb' I get the following.

Bus 001 Device 004: ID 0403:6001 Future Technology Devices International, Ltd FT232 USB-Serial (UART) IC

And nothing works….

  Reply

my2cents says:

October 20, 2012 at 12:44 am

The problem are the privileges on /dev/ttyUSB0.
I have added chmod 666 /dev/ttyUSB0 to the start procedure in /etc/init.d/gpsd.
The gps now works immediately after a reboot.

   Reply

Peter says:

October 14, 2012 at 2:21 pm

Nice post Peter M. I've just tried something similar with my GPS USB dongle and Raspberry Pi. Did you have any issues with gpsd auto starting when the GSP was plugged in? Peter C.

  Reply

petermount1 says:

October 15, 2012 at 4:42 pm

When I've used the receiver I've always have had the gps plugged in before powering the pi up so I've not tried to get gpsd to run only when it's plugged in.

  Reply

oaf357 says:

January 11, 2015 at 12:59 am

I am having issues with gpsd on startup. Did you come up with a solution?

   Reply

alex says:

October 16, 2012 at 11:40 am

This tutorial could be usefull http://www.cooking-hacks.com/index.php/documentation/tutorials/raspberry-pi-gps

  Reply

douglasfcalvert says:

October 23, 2012 at 8:25 pm

You should remove the ntp instructions, ntp is not using your gps for time. ntpd is using ns1.luna for the time. Your GPS is marked as a false ticker (hence the x) and your PPS signal is unreachable (0 in reach column). I'm not sure why you have the PPS signal marked as prefer?

  Reply

douglasfcalvert says:

October 23, 2012 at 8:36 pm

Also why did you set time1 to 0.183? Did you copy instructions from a sure gps tutorial?Or did you verify that 0.183 was the proper calibration offset?

  Reply

petermount1 says:

October 24, 2012 at 1:04 am

0.183 was used mainly due to that value being used by most other available examples in setting up gpsd.

Now that value might simply be one that's been reused for that same reason although one does mention its for the NMEA 183 standard, coincedence?

petermount1 says:

October 24, 2012 at 12:52 am

Yes when I did this I actually did it with no ntp instructions & with the gps line first. When the gps line was first it actually had the ntp instructions marked with an x.

What's in the article is what I had at the time when I wrote it but you're right about removing the ntp instructions.

Reply
Alex says:

PPS will always be 0 reach unless you make a modification to the dongle as it's not connected as far as I can tell – http://ei6iz.com/?p=108

Reply
Carlito says:

October 26, 2012 at 12:40 am

Hello,

and thanks for the tutorial, I get to the point in the tutorial where I
type in

"cgps -s"

I get the error "cgps: no gpsd running or network
error: -4, can't create socket"

I am accessing the pi using ssh from Ubuntu 12.04 (Debian GNU/Linux wheezy/sid)

If I type "gpsmon /dev/ttyUSB0″ I get data from the gps below (not quite close enough to the window at times)

/dev/ttyUSB0 9600 8N1 Garmin Serial binary> Time:
1970-01-01T00:00:00(null +— Position —++—- Satellite ——+ ¦
Fix: no fix ¦¦Ch PRN Az El SNR ST¦ ¦ Lat: -41.35342¦¦ 0 1 291 21 -1.0 0¦
¦ Lon: 173.18456¦¦ 1 11 303 5 -1.0 0¦ ¦ Alt: 61.56m¦¦ 2 14 91 25 -1.0 0¦
¦ Speed: 0.0m/s¦¦ 3 16 2 14 -1.0 0¦ ¦ Climb: 0.0m/s¦¦ 4 20 237 42 -1.0
0¦ ¦ Leap: 16sec ¦¦ 5 22 32 7 -1.0 0¦ ¦ epe: nanm ¦¦ 6 23 250 21 -1.0 0¦
¦ eph: nanm ¦¦ 7 25 133 23 -1.0 0¦ ¦ epv: nanm ¦¦ 8 30 21 42 -1.0 0¦ +–
ID 51 (0x33) +¦ 9 31 144 73 -1.0 0¦ ¦10 32 265 71 -1.0 0¦
¦11 255 0 0 0.0 0¦ +— ID 114 (0x72) —+

would you have any idea on the "can't create socket error" ?

regards

Carlito

Reply
David Taylor says:

October 27, 2012 at 6:58 pm

I have a device producing Trimble TSIP format output, but it doesn't produce any results from the cgps -s command. All the fields are blank and the command times out after a few seconds. The GPS works on a Windows PC in Trimble studio. Do I need to do anything to tell gpsd to look for TSIP messages, or set baud rate of whatever (yes, it's over USB). My USB lists as:

pi@raspberrypi ~ $ sudo lsusb
Bus 001 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
Bus 001 Device 002: ID 0424:9512 Standard Microsystems Corp.
Bus 001 Device 003: ID 0424:ec00 Standard Microsystems Corp.
Bus 001 Device 005: ID 04d8:00df Microchip Technology, Inc.

and the GPS is plugged into the lower USB socket. I can't see a reference to /dev/ttyUSB0 in the log, but I do see a reference to ttyACM0:

I'm very new to this, so please forgive me if these are obvious questions!

Thanks, David

Reply
David Taylor says:

October 27, 2012 at 7:02 pm

Feeling stupid now – tried the gpsd start with ttyACM0 and it's working OK.

Reply
David Taylor says:

October 29, 2012 at 10:16 am

I find that I need to enter the command:

sudo gpsd /dev/ttyACM0 -n -F /var/run/gpsd.sock

once per boot to get gpsd started. How can I automate this – something to do with /etc/init.d I know, but precisely what should I eidt and how? I have virtually no knowledge of Linux but I have managed to get NTP/PPS working thanks to notes on the Web). I also need to know how to get ntpd to auto-start – I seem to have lost that when installing the re-compiled version.

Thanks.

David Taylor says:

October 29, 2012 at 12:23 pm

OK, so I found dpkg-reconfigure, and now gpsd starts at boot, but I still need to run cgps -s before NTP will detect the GPS (type 28 driver).

   Reply

Chris says:

November 7, 2012 at 1:04 am

Most USb GPS dongles do not connect the 1PPS to any of the appropriate lines in the UART-USB chip so they are strictly NEMA devices if left unmodified. In theory one could connect a tiny wire from the appropriate wire on the GPS module to the appropriate line on the UART to USB chip so that the emulation of a serial port device would include the DCD or similar 1PPS signal. But the accuracy of the timing would still be dependent on the latency of the USB connection which would mean not so great. Has anybody been able to utilize a kernel 1PPS on the Raspberry Pi? That would be very nice because the inexpensive RPI is fast enough to be a nice NTP server. You could disconnect the GPS chip from the UART-USB and connect the GPS directly to the RPI through the UART interface for the ASCII and use a GPIO for the 1pps

   Reply

David Taylor says:

November 12, 2012 at 10:11 am

Yes, please see: http://www.satsignal.eu/ntp/Raspberry-Pi-NTP.html

   Reply

petermount1 says:

November 12, 2012 at 10:17 am

Nice article. I was going to try a dedicated gps receiver rather than a usb one (actually ordered some prototyping boards for the rpi on ebay yesterday).

One thing, you have a section about the time being 16 seconds out – a coincidence that GPST is 16 seconds ahead of UTC perhaps?

David Taylor says:

November 12, 2012 at 1:54 pm

Thanks for your comments. The only problem with the USB device appears to be initial recognition, and if you have Internet NTP servers for the coarse seconds then the PPS is recognised and used to discipline the NTP server. The u-blox device which is serial rather than USB serial showed some slight oscillations during initial tests which I need to investigate further, but it still well within 10 microseconds.

Yes, the 16 seconds is because the Trimble device has no battery backup, and starts emitting GPS seconds rather than UTC. Only once enough information has been downloaded from the GPS satellites does it discover what the GPST-UTC offset actually is, and only then does it send out UTC. I believe that gpsd is supposed to detect this by not filling in the shared memory until the value of (GPST-UTC) is greater than 10 seconds. I'll clarify that section.

26. *Tutoriel pour débuter avec le Raspberry Pi - Blog benji1000.net* says:
November 8, 2012 at 11:07 pm
[…] des volets, clim, ondes radios…). À consulter, ce blog qui vous indique comment utiliser votre Raspberry Pi avec un GPS (clé USB de moins de 30$ […]

   Reply

ben says:

November 22, 2012 at 10:14 pm

Hi, I have the same GPS as you (£25). I am having problems with the first step. I havnt used any of this stuff before and only used windows. I have downloaded gspd software and put it on a usb memory stick and it is connected to the internet. When i first started it did some processing lines then asked if i wanted to use up some space on the SD card it then said problem connecting to websites. so after then connection to the internet it comes up with E: error. any ideas? where do i put the dowloaded files? (taken from here http://download.savannah.gnu.org/releases/gpsd/ and using the latest update)

Any ideas?

Ben

   Reply

Chris says:

December 1, 2012 at 6:30 pm

First, all of you, thank you for all of your help. I'm having the permissions problem (my NTP is not seeing my NMEA GPS and the gpsd > ntp connection is sometimes working but more often is failing to be seen) and I'm not sure if the suggestion here to change the permissions of the /dev/tty* file is the correct one.

GPSd drops privileges to the "nobody" group after it starts and the /dev/gps0 symlink created by gpsd is owned (on my raspbian/raspberry pi) by root with a group of root while the ttyUSB0 device is owned by root but its group is the dialout group. I think this issue may be behind some of the issues people are having. I wonder what the gpsd developers and the debian package maintainer would say was the best approach?

   Reply

Nigel says:

December 15, 2012 at 12:34 pm

I tried what you suggested above and it works fine, however as soon as I disconnect the ethernet cable to the internet ntp dies.

Ideally I'd like to be able to get time and 1pps from the gps and run the pi standalone…

any ideas what I need to do to fix this?

   Reply

petermount1 says:

December 22, 2012 at 8:45 am

Sorry for the late reply, I've been on holiday.

I'll take a look at the ethernet issue at some point over the weekend although one thing to try is to comment out the remote ntp servers from the config (which I left in in the article) and leave just the gps – that's what I'm going to try.

As for the 1pps, from what I've since found out most usb sticks don't have it although for some it's a case of soldering a wire to the usb serial port so that the 1pps is carried over one of the serial control lines. Again I've not had time to work on that one (yet) but might be a solution.

Reply

Nigel says:

January 20, 2013 at 5:34 pm

if anyone else is trying to set system time from gps standalone (in python) this worked for me…

credit goes to n sweeting at raspberrpi.org and you can download it from http://code.google.com/p/gpstime/

```
import os
import sys
import time
from gps import *

print 'Attempting to access GPS time…'

try:
gpsd = gps(mode=WATCH_ENABLE)
except:
print 'No GPS connection present. TIME NOT SET.'
sys.exit()

while True:
gpsd.next()
if gpsd.utc != None and gpsd.utc != ":
gpstime = gpsd.utc[0:4] + gpsd.utc[5:7] + gpsd.utc[8:10] + ' ' + gpsd.utc[11:19]
print 'Setting system time to GPS time…'
os.system('sudo date –set="%s"' % gpstime)
print 'System time set.'
sys.exit()
time.sleep(1)
```

David Taylor says:

December 22, 2012 at 8:46 am

Nigel, perhaps you could post your ntp.conf for us to check? You certainly /should/ be able to do what you want, but I can't test it here as my terminal connection to the Pi is via Ethernet!

Reply

Nigel says:

December 31, 2012 at 8:13 pm

David, Peter

thanks for your replies – you have to comment out the lines in ntp.conf (which I guess make it look at the ethernet port..)

```
#server 0.debian.pool.ntp.org iburst
#server 1.debian.pool.ntp.org iburst
#server 2.debian.pool.ntp.org iburst
#server 3.debian.pool.ntp.org iburst
```

then I get:

```
root@raspberrypi:/home/pi# sudo ntpq -p
remote refid st t when poll reach delay offset jitter
==============================================================================
SHM(0) .NMEA. 0 l – 64 0 0.000 0.000 0.000
root@raspberrypi:/home/pi#
```

I am not trying to use the 1pps as my gps does not have one…

David Taylor says:

January 2, 2013 at 11:50 am

Nigel, at the risk of repeating myself, could you please post your ntp.conf for us to check?

Nigel says:

January 19, 2013 at 12:12 pm

David – sorry I haven't deliberately been ignoring you but the start of the year has been busy. regards Nigel

here it is:

/etc/ntp.conf, configuration for ntpd; see ntp.conf(5) for help

driftfile /var/lib/ntp/ntp.drift

Enable this if you want statistics to be logged.
#statsdir /var/log/ntpstats/

```
statistics loopstats peerstats clockstats
filegen loopstats file loopstats type day enable
filegen peerstats file peerstats type day enable
filegen clockstats file clockstats type day enable

# You do need to talk to an NTP server or two (or three).
#server ntp.your-provider.example

# pool.ntp.org maps to about 1000 low-stratum NTP servers. Your server will
# pick a different set every time it starts up. Please consider joining the
# pool:

#comment out internet servers so it picks up the gps only…
#server 0.debian.pool.ntp.org iburst
#server 1.debian.pool.ntp.org iburst
#server 2.debian.pool.ntp.org iburst
#server 3.debian.pool.ntp.org iburst

# Access control configuration; see /usr/share/doc/ntp-doc/html/accopt.html for
# details. The web page
# might also be helpful.
#
# Note that "restrict" applies to both servers and clients, so a configuration
# that might be intended to block requests from certain clients could also end
# up blocking replies from your own upstream servers.

# By default, exchange time with everybody, but don't allow configuration.
restrict -4 default kod notrap nomodify nopeer noquery
restrict -6 default kod notrap nomodify nopeer noquery

# Local users may interrogate the ntp server more closely.
restrict 127.0.0.1
restrict ::1

# Clients from this (example!) subnet have unlimited access, but only if
# cryptographically authenticated.
#restrict 192.168.123.0 mask 255.255.255.0 notrust

# If you want to provide time to your local subnet, change the next line.
# (Again, the address is an example only.)
#broadcast 192.168.123.255

# If you want to listen to time broadcasts on your local subnet, de-comment the
# next lines. Please do this only if you trust everybody on the network!
#disable auth
#broadcastclient

#gps ntp server…
server 127.127.28.0 minipoll 4
fudge 127.127.28.0 time1 0.183 refid NMEA
```

geof says:

December 19, 2012 at 9:43 pm

Anytime I try to run cgps or xgps, I get an "Illegal Instruction" error. Any idea what could be wrong?

Reply

petermount1 says:

December 22, 2012 at 8:51 am

Not off hand, when I ran those commands it worked. Are there any other errors happening? For example take a look at /var/log/syslog or /var/log/messages and see if anything stands out.

What I'm thinking is that perhaps there's a problem between the RPi and the GPS – I have heard of issues with either too much power being drainded from the rpi or the reverse, a powered usb hub is used but it leaks some power back to the RPi – I think that shows up in syslog as Error 71 from the USB modules?

Reply

geof says:

December 22, 2012 at 10:07 am

Thanks for your answer. In fact, I was using the wrong version of cgps. It's working perfectly now, thanks to your tutorial!

raphael schitz (@hypervisor_fr) says:

December 29, 2012 at 3:48 pm

Thanks for this great post Peter. Anyway, I had to start gpsd this way to make it work #sudo gpsd -F /var/run/gpsd.sock /dev/ttyUSB0

Reply

32. *Adventures with RPi Part III – wlan and gps* says:
January 14, 2013 at 12:26 am

[…] plugged in the GPS device, and following this advice fired off some […]

Reply

Ole Mose says:

January 23, 2013 at 12:45 pm

Thanks for this great article.
It works just as expected here.
One question though. Is it possible to retrieve atomic data from the GPS with cgps or one of the other utilities?
I only need the Latitude, and Longitude, and i need my own software to read these information's, when they are needed.

Reply

Andy Burton says:

January 24, 2013 at 2:54 pm

Fantastic post – i have this working on my RPi with a Globosat BU-353.

I had to kill gpsd and restart to get ntp working as you said – but other than that all perfect!

Reply

petermount1 says:

February 4, 2013 at 1:35 pm

Whilst looking at the element14 forums I came across this: http://www.element14.com/community/message/68918#68918/l/re-difficulties-using-ntp-with-a-gps-raspberry-pi-help

It looks like some have had problems with these instructions since I originally wrote them & there's a couple of interesting tips in there.

There's also a link to http://code.google.com/p/gpstime/ which, when I get some spare time I'll have a look at myself.

Reply

Martin says:

February 24, 2013 at 6:00 pm

Peter, I'm a complete "noob" as far as Linux and the Pi are concerned, and I am trying all of the USB devices that we have with the Pi! We have a GPS Tracker 1-gotU GT-200e from Maplin UK (A47JU) which we use when out and about. I Just used your instructions, connected the device, and lo and behold I see all the data in cgps and all the satellites in xgps – wonderful; thank you so much! Unfortunately gpsd appears to stop after around 5 mins, nevertheless I shall derive a lot of enjoyment playing with the device now.

Reply

37. *Hello world! | gibbyn* says:
February 28, 2013 at 2:41 am
[…] http://blog.retep.org/2012/06/18/getting-gps-to-work-on-a-raspberry-pi/ […]

Reply

Ahmed T Hawas says:

March 7, 2013 at 10:17 pm

hello Sir i have followed ur totrial but i get error that when i open cgps -s all the reading are n/a also it close the window an say gps time out

Reply

petermount1 says:

March 7, 2013 at 10:40 pm

How long do you leave it running? It could take a while before the receiver picks up enough GPS satellites for it to get a position so until then it would show N/A.

Reply

39. *Booby.fr – Tutoriel pour debuter avec le raspberry pi* says:
March 21, 2013 at 3:12 pm
[…] des volets, clim, ondes radios…). À consulter, ce blog qui vous indique comment utiliser votre Raspberry Pi avec un GPS (clé USB de moins de 30$ […]

Reply

Jack says:

March 29, 2013 at 10:57 am

great job … i am currently working on a car tracking system and needed to know if it is possible to track my car using a GPS module connected to a Raspi ??

Reply

41. *RasNTP : du Stratum 1 dans votre homelab - Hypervisor.fr* says:
April 15, 2013 at 7:12 am
[…] sur le blog de Peter Mount que nous avons pu trouver un howto des plus simples au quel nous avons ajouté un dongle wifi usb […]

Reply

Jay says:

April 19, 2013 at 11:42 pm

Great information, I was able to get a Phario GPS-360 to work, thanks!

Reply

Georgian Borca says:

May 26, 2013 at 8:17 pm

Hi very nice tutorial, thanks. But How to i change the baundrate? my GPS receiver uses 38400 and if I'm using the " cat /dev/ttyUSB0″ i get on weird characters on terminal. Thanks in advance.

Reply

petermount1 says:

You need to use stty to set the baudrate.

e.g. Something like this should work:

stty -F /dev/ttyUSB0 38400

Then when you run cat it should appear fine.

Reply

Alexander Stielau says:

Hi, i found a strange problem with raspberrypi and gpsd, i got a fix with a suitable position, but a wrong date in 1993 – 20 years ago.

{"class":"TPV","tag":"MID2″,"device":"/dev/ttyUSB0″,"mode":3,"time":"1993-10-25T09:45:37.000Z","ept":0.005,"lat":53.557053675,"lon":9.925919621,"alt":55.225,"epx":10.803,"epy":11.938,"epv":35.729,"track":17.7708,"speed":0.494,"climb":-0

I used a lot of time to understand this, the same device worked fine in other linuxboxes.

Rootcause and solution:
The raspberry has – as everyone knows 🙂 no rtc, so it is possible that it runs on a totaly wrong date/time.
GPS had a week number rollover in 1993 (its like the year 2000 issue, but for gps receivers).

So, if the local time on the raspberry is set to the actual year before starting the gpsd (e.g. date -s "20013-06-10″ in the gpsd start script) it gets the right date/time from the gps and everything is fine.

peuch

Reply

petermount1 says:

Good spot. I've not noticed it as my PI's seem to start with a recent date whenever I start them so they've always been post rollover.

The rollover is due to the GPS week number being 10 bits (e.g. 1024 weeks) and the last time was <u>1999</u> and the next one in <u>2019</u>.

Reply

David Taylor says:

With Raspbian, there is a file /etc/fake-hwclock.data which has the current data and time, updated every so often. I understand that file is used early in the boot process to initialise the system time. There are a few folk reporting GPS issues, with receivers with various firmware, when the date gets within 500, 512 or 768 weeks of a roll-over event. Having a Internet pool servers should help resolve any ambiguity.

petermount1 says:

Yes, as long as that file's contents is within range of a roll-over event then it should be fine.

Under normal use using an ntp server would then bring it into sync but that's not possible if there's no network connection – which was one of the reasons of using GPS instead.

Fabio Brandespim says:

Thanks for sharing this. I just set up my raspberry with gps parallax module and thanks to you my raspberry now can update its time using the gps. 🙂

Reply

Dhruv says:

I'm using the same GPS receiver as this for a project. I only need/want the GPGGA and GPRMC sentences fromt the receiver but I'm having trouble configuring it. Do you know if it's possible to configure this particular receiver using the PMTK commands? Or is there any other way for me to only get the GPGGA and GPRMC sentences?

Reply

Richard says:

Thank you for writing this. It's

Reply

Rene says:

Newbie question :
I have connected a Navibe GM720 gps dongle, and followed this tutorial step by step, but it doesn't woek with cgps; However, my dongle is detected
>lsusb
…

Bus 001 Device 010: ID 067b: 2303 Prolific Technology, Inc. PL2303 Serial Port.
I guess i have to configure the virtual serial port in order it works with cgps, but I don't know how to do it.
thank you for toutr help,

Reply

Rene says:

January 9, 2014 at 3:04 pm

Sorry : I put the dongle in the right place and got a fix 😦

Reply

Gary Mirams says:

January 11, 2014 at 6:17 pm

Did you ever get to the bottom of the problem in the notes at the end? I'm getting that now with the Adafruit Ultimate GPS.

Reply

petermount1 says:

January 22, 2014 at 11:42 am

No I never did solve that problem

Reply

pawan kumar says:

May 29, 2014 at 8:10 am

hi all,

I am designing a GPS tracker which will be used to get a distance between two point. I am using Arch linux arm for raspberry pi model b. I am planning to get the data in a file every second and use lat and long parameter to calculate distance with hoversine formula.
my main problem is how to get the data in file instead of gui

Thanks in advance

Reply

51. *GLOBALSAT ND-100 ND USB GPS Module | Poseidon* says:
August 5, 2014 at 8:51 pm
[…] picked up the GlobalSat ND-100 module after reading this blog, so I knew it would […]

Reply

m whitton says:

August 14, 2014 at 10:20 pm

Thanks. This worked like a charm for me. I purchased the GPS USB dongle from Amazon USA and connected it to my pi and it works well.

Reply

53. *Setting up the Raspberry Pi – a collection of links | rPi Kitchen* says:
September 18, 2014 at 8:55 pm
[…] http://blog.retep.org/2012/06/18/getting-gps-to-work-on-a-raspberry-pi/ […]

Reply

Andrew says:

December 12, 2014 at 7:54 pm

Thanks for this, just got myself a Pi B+ and a NS-100S for this very thing but I am having some problems.

It appears that the ntpd demon is not getting time from the GPS dongle. when I enter a 'ntpq -p' I get

root@raspberrypi:/var/log/ntpstats# ntpq -p
remote refid st t when poll reach delay offset jitter
==
SHM(0) .NMEA. 0 l – 16 0 0.000 0.000 0.000
SHM(1) .PPS. 0 l – 16 0 0.000 0.000 0.000

From a 'ntpq > as' command I get:
root@raspberrypi:/var/log/ntpstats# ntpq
ntpq> as

ind assid status conf reach auth condition last_event cnt
===
1 16239 802b yes no none reject clock_alarm 2
2 16240 802b yes no none reject clock_alarm 2

My ntpd.conf is:

Configuration for USB GPS NTP
server 127.127.28.0 minpoll 4
fudge 127.127.28.0 time1 0.183 refid NMEA
server 127.127.28.1 minpoll 4 prefer
fudge 127.127.28.1 refid PPS

Output from cgps -s shows that I have 10 gps locks, a 3D FIX (9 secs) etc.

I just have no idea, I'm bashingmy head in to figure this out.

Reply

55. *How do I attach a GPS receiver? | CL-UAT* says:
December 23, 2014 at 10:39 pm
[…] this blog post: http://blog.retep.org/2012/06/18/getting-gps-to-work-on-a-raspberry-pi/. It covers ntp in […]

Reply

Jessica Hart says:

January 17, 2015 at 10:26 am

This will allow you to keep the Pi and GPS breakout indoors, but run the.

Reply

57. *Getting data from the GPS dongle | PiGPS* says:
January 23, 2015 at 9:40 pm
[…] also use xgps. This will also show you a graphical representation of the satellites used. I found Peter Mount's Blog and used it as a guideline in setting up my […]

Reply

andy says:

January 29, 2015 at 10:36 am

i'm also playing with some GPS receivers on my RPi connected directly to the GPIO pins (using 3.3V, ground and RX).
the first chip is a Ublox AMY6M chip and i get a fast connection with 4-5 satelites (57600bps UBX binary).
the second chip is a "telit J-N3 flash" running at 9600bps and sending a SiRF binary. i also got the cgps running, i get 10 good satelites, but at the end in the "USED" line, they al say "N".
i don't get a fix, not a clock, really notthing at al in the other fields. also tryed in XGPS but same problem. 10 good visible satellites, not one is used and i don't get a fix.

anybody any ideas?

Reply

WReeve says:

February 10, 2015 at 11:17 pm

Peter – I am having trouble using the shared memory feature of GPSD to supply coarse time to the Pi. I am successfully using PPS for precise seconds. My goal is to make a standalone NTP server for LAN use only (no internet access to external servers or server pool).

GPSD appears to be running fine, as is PPS. I see the appropriate GPSD output using cgsp -s and gpsmon. I have the North American server pool setup in ntp.conf.

When I install the GPSD SHM driver (.28.0) with prefer option in ntp.conf, restart ntp service and then run ntpq -p, I see the offset and other data but nothing in column 1 (although I am not sure if anything should be there). The PPS shows correct data with "o" in column 1.

Now, if I comment out the other servers (server 0.north-america.pool.ntp.org and so on).and restart ntp service, then neither PPS nor GPSD show any data in the query, only zeroes. In other words, without those external servers, NTP is not working as standalone.

I have searched and searched but cannot find any troubleshooting info that helps me locate the problem and hope someone here can help me resolve it. Thanks

Reply

David Taylor says:

February 11, 2015 at 10:05 am

As I already replied to your direct e-mail., likely this is because you are not waiting long enough for the GPS receiver to download the offset between UTC and GPS time. A battery backup for the GPS receiver may help. Please see:

http://www.satsignal.eu/ntp/Raspberry-Pi-NTP.html#GPS-time

Reply

Matt Grund says:

February 23, 2015 at 10:28 pm

I bought a PL2303 dongle from Adafruit late in 2014. Looks like its a PL2303X – NOT a pl2303. This dongle doesn't work out of the box, with my kernel (3.0.35). It seems like I need to patch the kernel: http://koti.mbnet.fi/lonnberg/pl2303x.htm

Reply

n7uv says:

March 1, 2015 at 6:02 pm

Thank you for this instructive tutorial. I am new to Linux and to RPi and have been beating my head against both as I climb the fairly steep learning curve %^)

With this article, I was finally able to get gpsd, gpsmon, and cgps all running on the RPi (192.168.1.41) hosting the USB-connected uBlox 6 GPS engine. I can open any number of terminal windows now and run multiple copies of gpsmon, allowing me to validate that gpsd supports multiple clients. That is great.

What I have not been able to do is get gpsmon running on a second RPi (192.168.1.236) to connect successfully to the gpsd on the first unit and display the gps data. I get the following error message when trying:

pi@piaware ~ $ gpsmon 192.168.1.236
gpsmon: connection failure on 192.168.1.236:2947, error -6 = can't connect to host/port pair.

Any ideas what I'm doing wrong?

Cheers – Jon

Reply

yasmany says:

Hi, how send the position of GPS RPi to my App Web for show in API of Google Maps??

Reply

Savio Sacco says:

Thanks for the tutorial. Following your instructions I managed to get the USB GPS receiver to work with the PI 2 and I can get a fix using xgps. I was wondering if you could point me to a tutorial that would help me make a python program that would make use of the information being received from the receiver. My ultimate goal is to make it transmit the co-ordinates via http requests, but for now it would be enough to just get the program to display the latitude and longitude on screen. Thanks!

Reply

Emily says:

Hi– thank you for the tutorial. I am having trouble launching the display for xgps. Whenever I try i get

/usr/lib/python2.7/dist-packages/gtk-2.0/gtk/__init__.py:57: GtkWarning: could not open display
warnings.warn(str(e), _gtk.Warning)
/usr/bin/xgps:444: Warning: invalid (NULL) pointer instance
self.window = gtk.Window(gtk.WINDOW_TOPLEVEL)
/usr/bin/xgps:444: Warning: g_signal_connect_data: assertion 'G_TYPE_CHECK_INSTANCE (instance)' failed
self.window = gtk.Window(gtk.WINDOW_TOPLEVEL)
/usr/bin/xgps:445: GtkWarning: IA__gdk_screen_get_display: assertion 'GDK_IS_SCREEN (screen)' failed
if not self.window.get_display():
Traceback (most recent call last):
File "/usr/bin/xgps", line 860, in
base = Base(deg_type=degreefmt)
File "/usr/bin/xgps", line 446, in __init__
raise Exception("Can't open display")
Exception: Can't open display

Anyone possibly know what the problem might be? i have no problem launching cgps.

Thanks!

Reply

petermount1 says:

How are you connecting to your pi? Is it from the command line? It sounds like you're connecting to either a remote PI using ssh or you are running it on the pi as root but connected to the desktop as the pi user.

If it's ssh from another pi/linux box, try adding -Y to the ssh command line, i.e.: ssh -Y user@host – then it will create a tunnel for xwindows to work.

If it's from the command line try using gksudo instead, then it'll run xgps as root but still give it access to the local xwindows session.

Peter

Reply

Emily says:

I am connected remotely, and I did add -Y (i also used pgrep -fl ssh to double check it worked) but still no success. Any other suggestions?

Thanks again!

petermount1 says:

I'm afraid not. What OS are you calling the PI from?

66. *Serial Data Connection on Raspberry Pi with GARMIN GPS 12 | brruchstücke* says:

[…] i gave it up to try it with the old GPS 12. now i try to get GPS-data with the newer GPSMAP 64s. after plugging usb to raspi, i see it with "Garmin International" after the lsusb-command. after that i installed gpsd gpsd-clients python-gps sudo apt-get install gpsd gpsd-clients python-gps infos from here and here […]

Reply

1 Follow

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