



# Raspberry Pi Applications

NTP SERVER

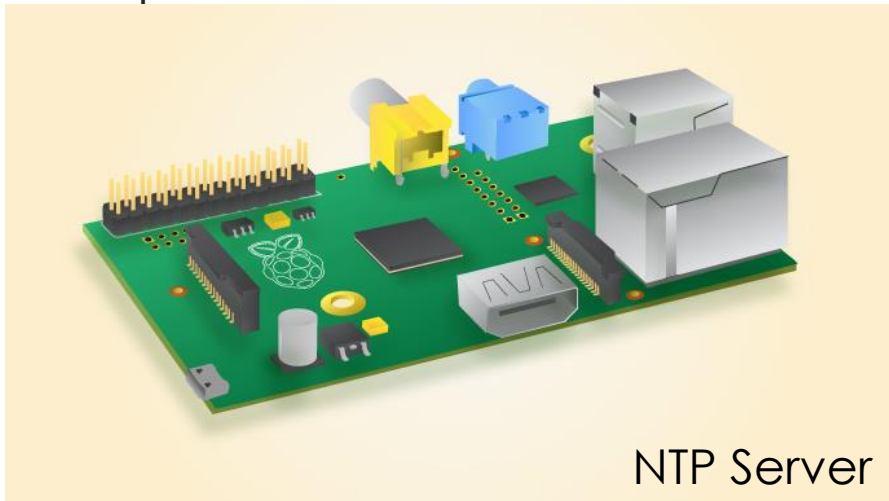
SDR DONGLE SERVER

RAY HITT, N8VMX

# Raspberry Pi Configurations

## ▶ Raspberry Pi 1 Model B Specs

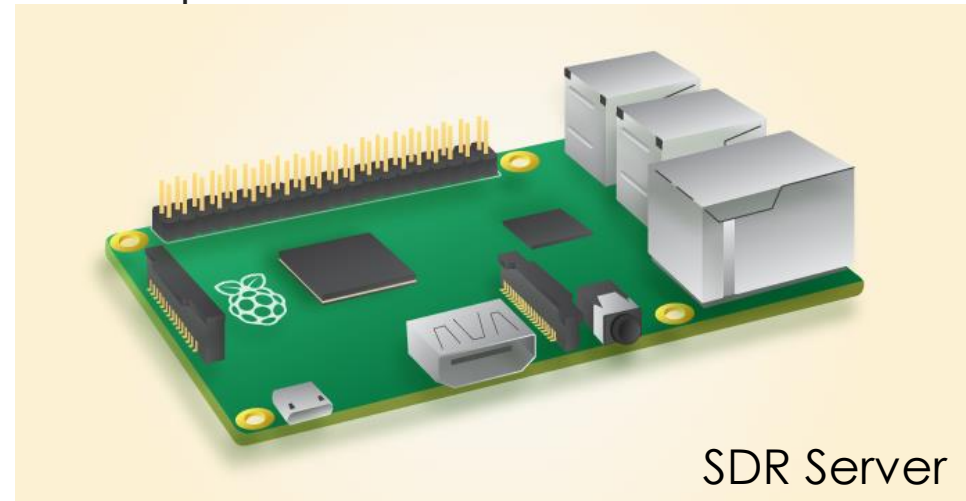
- 700 MHz ARM 6.1 processor
- 512 MB RAM
- 2 USB Ports
- 100 MBPS Ethernet port
- HDMI port



NTP Server

## ▶ Raspberry Pi 2 Model B

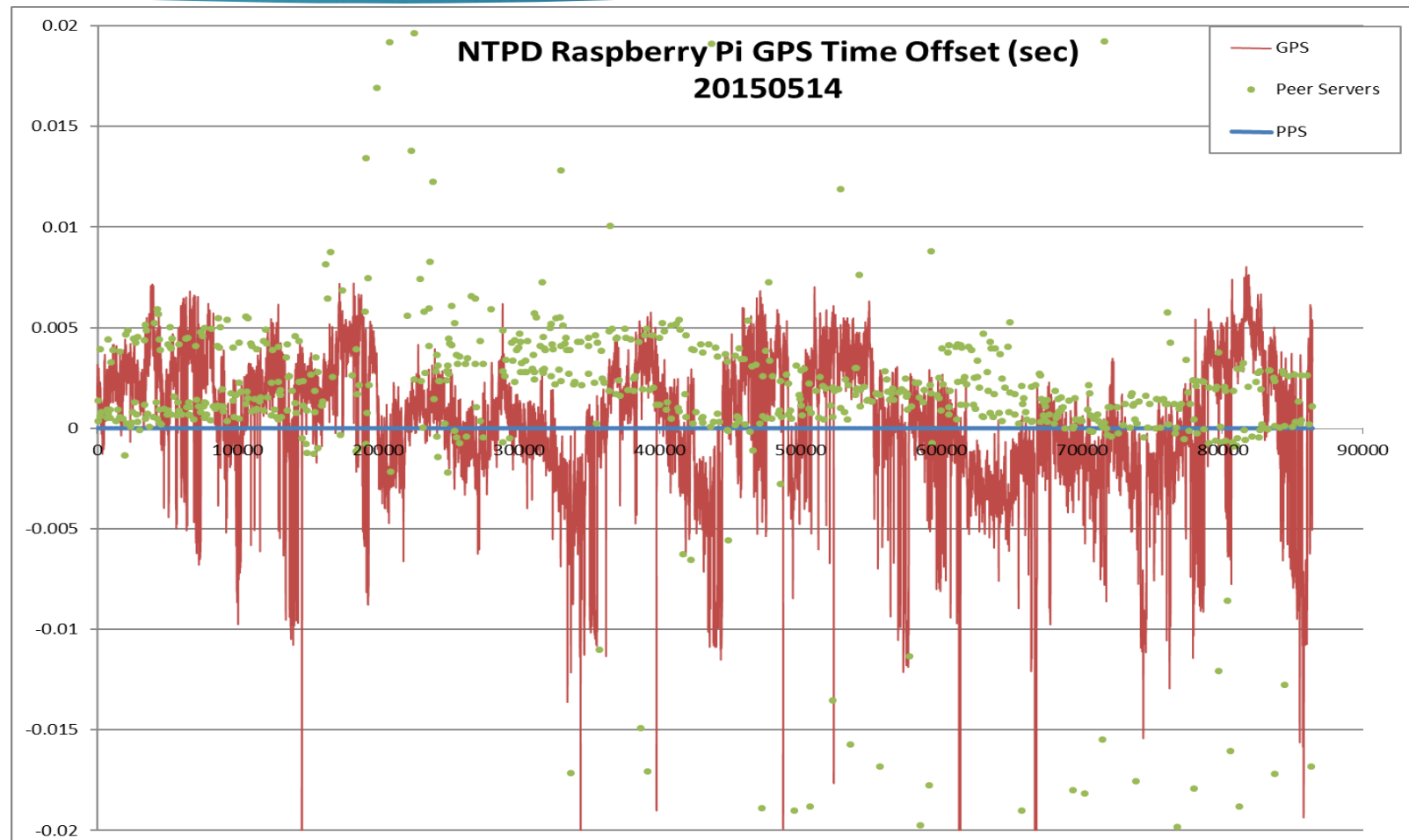
- 900MHz quad-core ARM Cortex-A7 CPU
- 1GB RAM
- 4 USB ports
- Ethernet port
- HDMI port



SDR Server

# What is an NTP Server?

- ▶ Method to distribute accurate time to network computers
- ▶ Accessible via Internet or standalone with GPS
- ▶ Accuracies
  - ▶ Internet: around 5 msec
  - ▶ GPS (NMEA): around 5 msec
  - ▶ GPS (PPS): around 1  $\mu$ sec



# Raspberry Pi 1 Model B NTP Server

- HAB GPS Expansion Board
- [http://ava.upuaut.net/store/index.php?route=product/product&path=59\\_60&product\\_id=117](http://ava.upuaut.net/store/index.php?route=product/product&path=59_60&product_id=117)
- Software (Added via apt-get install)
  - PPSTOOLS
  - GPSD
  - NTP



```
hittra@pi-B[8:23:02]:~$ ntpq -p
=====
remote           refid           st t when poll reach  delay  offset jitter
=====
oPPS(0)          .PPS.           0 l   5   8  377   0.000   0.001  0.004
SHM(0)           .GNSS.          15 l   5   8  377   0.000  -4.138  1.503
*199.102.167.190 128.252.19.1    2 u  37  64  377  43.159   7.816  1.318
198.110.48.12 ( 64.113.32.5  2 u 28h  64    0  45.985   1.192  0.000
+time-b.timefreq .ACTS.          1 u  50  64  377  56.605   7.167  2.840
+199.102.46.76 ( .GPS.         1 u  13  64  377  40.237   6.104  1.735
hittra@pi-B[8:23:25]:~$ █
```

# Raspberry Pi 2 Model B SDR Server

- ▶ Compile rtl-sdr
- ▶ Detailed directions on <http://sdr.osmocom.org/trac/wiki/rtl-sdr>
- ▶ Accessible via wifi
  - ▶ Windows 7 (SDR #)
  - ▶ Linux (GNURadio)
  - ▶ 802.11ac recommended for higher sample rates

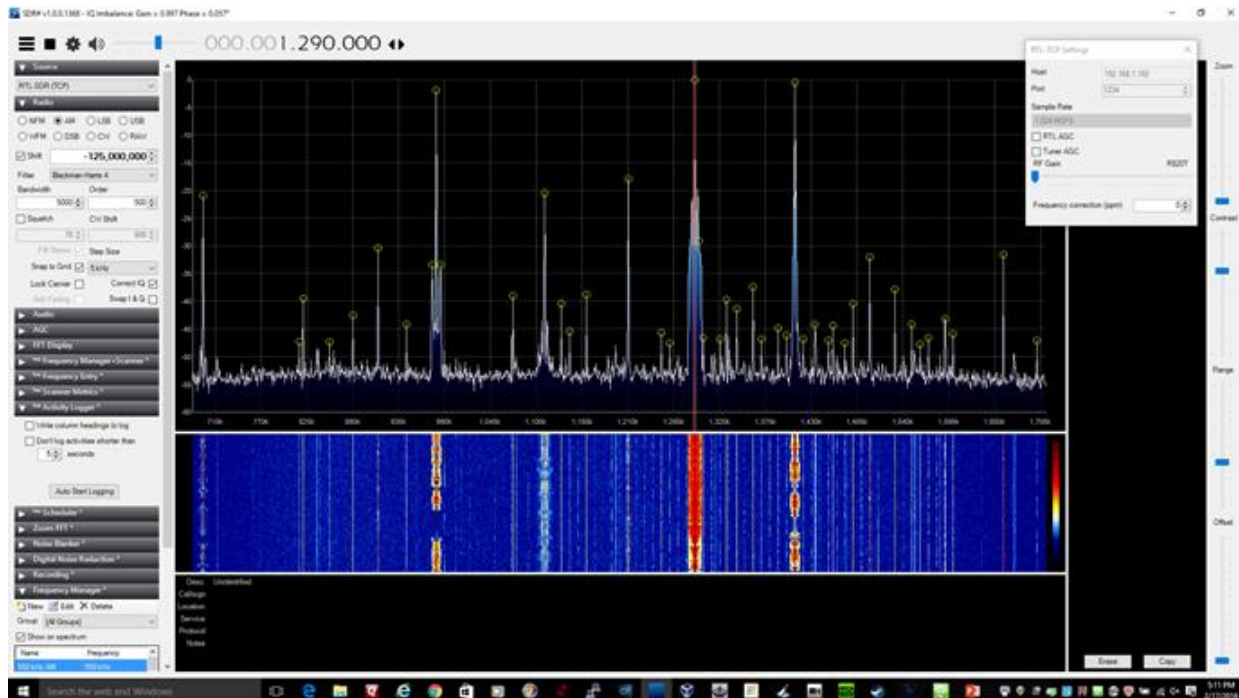
```
192.168.1.102 - PuTTY
hittra@raspi-2[8:35:44]:~$ rtl_tcp -a 192.168.1.102 -s 1024000
Found 1 device(s):
 0: Realtek, RTL2838UHIDIR, SN: 00000001

Using device 0: Generic RTL2832U OEM
Found Rafael Micro R820T tuner
[R82XX] PLL not locked!
Tuned to 100000000 Hz.
listening...
Use the device argument 'rtl_tcp=192.168.1.102:1234' in OsmoSDR (gr-osmosdr) source
to receive samples in GRC and control rtl_tcp parameters (frequency, gain, ...).
```

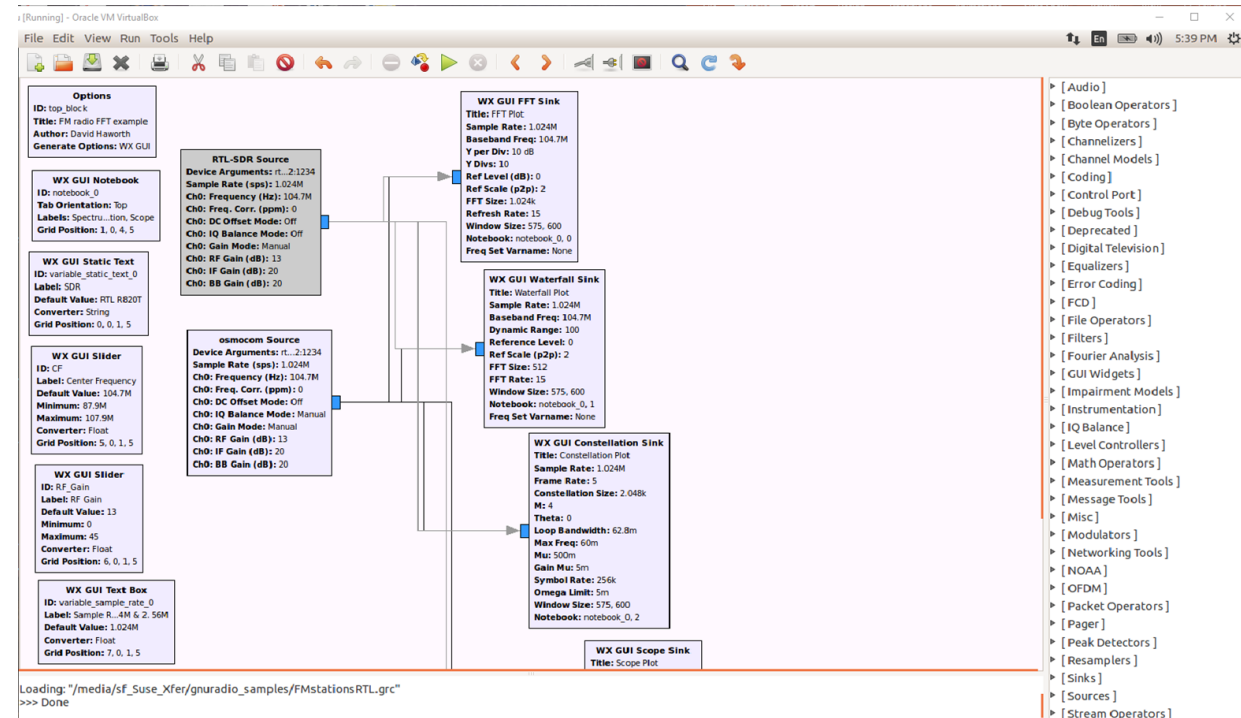


# PC Software Snapshots

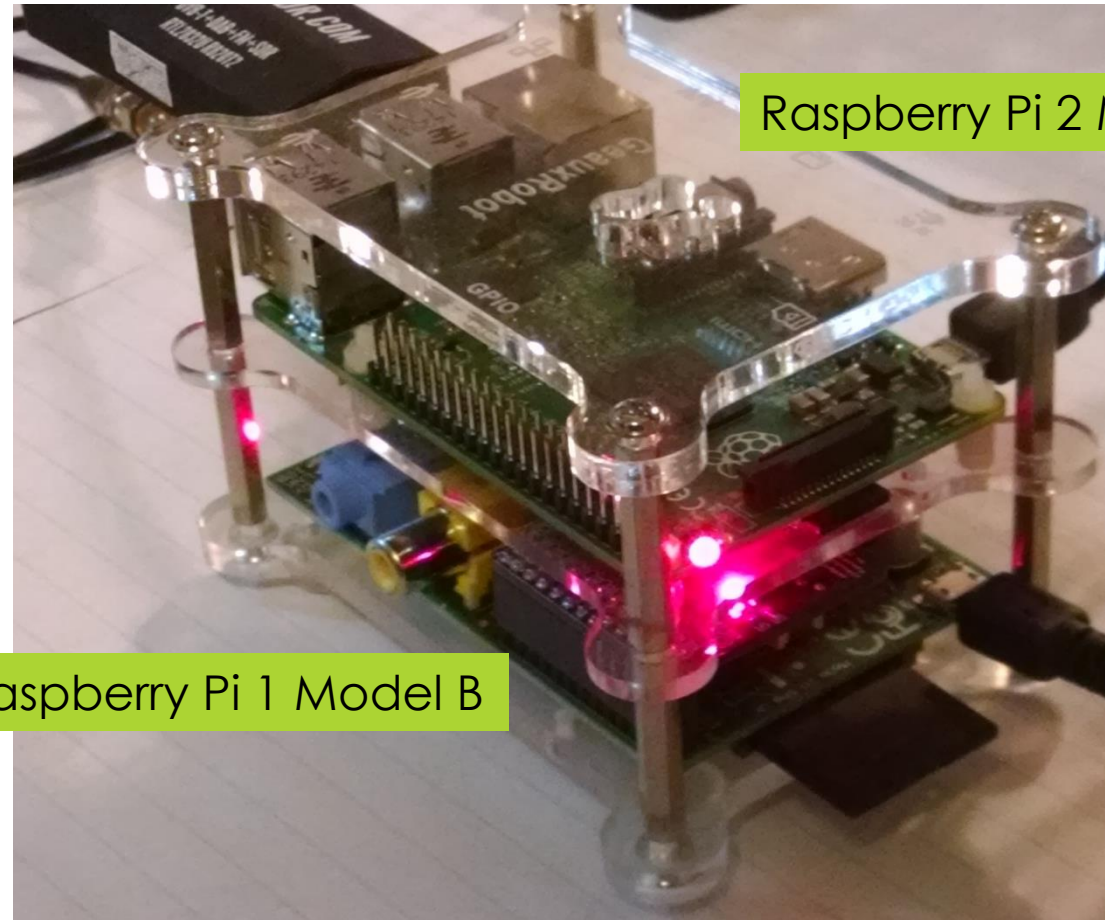
SDR# (SDR Sharp) – Windows 10



GNU Radio Companion (Linux)



# Stacked Raspberry Pi Configuration



Raspberry Pi 2 Model B

Raspberry Pi 1 Model B