With thanks to …

FAB LAB LIMERICK

THE ROBINSON ANEMOMETER.

FREE YOUR WEATHER STATION!

War Stories from hacking a Weather Station

Ray Kinsella

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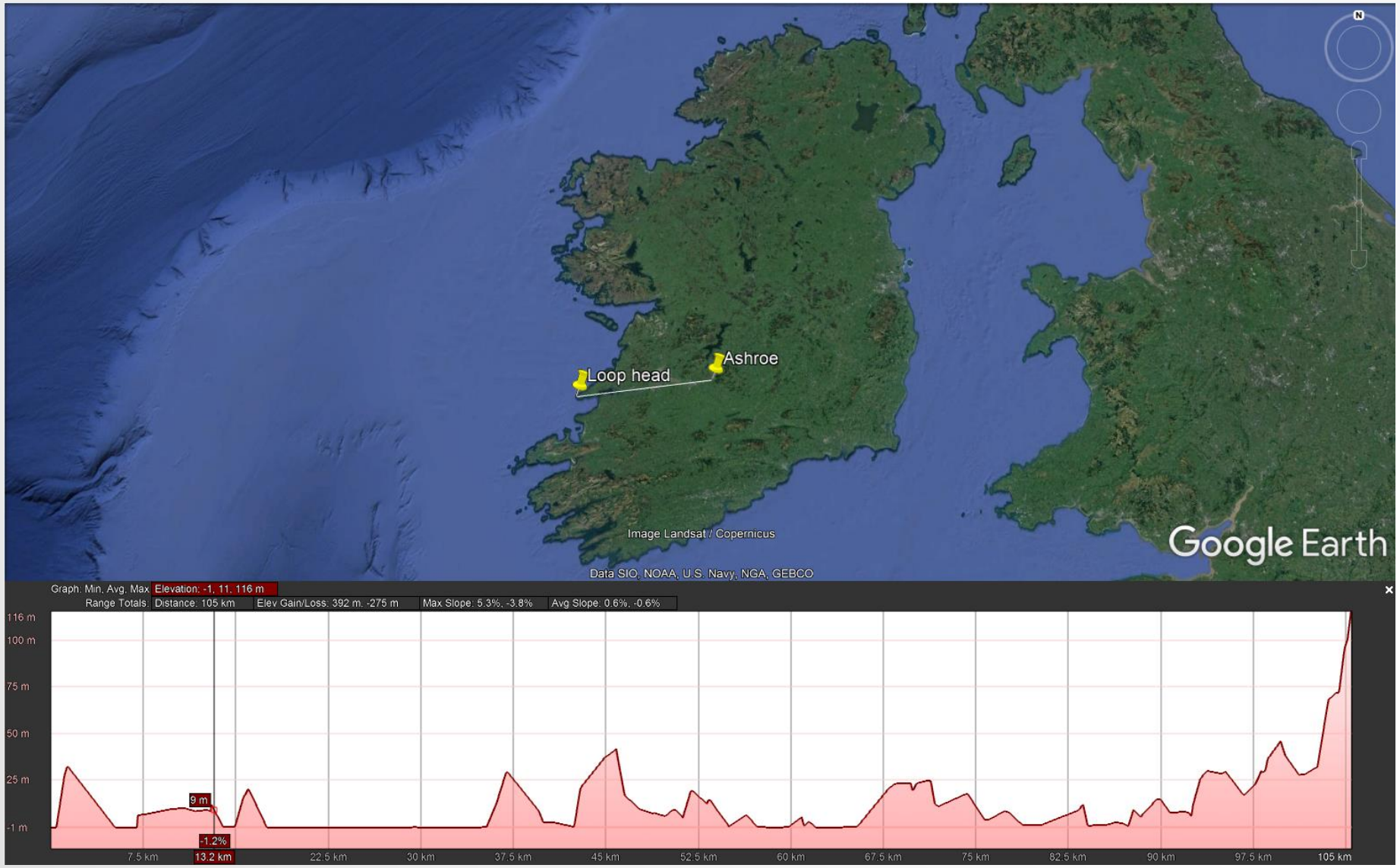
Email: mdr [at] ashroe.eu
IRC: mortderire

The Robinson Anemometer. Archival Photograph by Mr. Sean Linehan, NOS, NGS - The Aims and Methods of Meteorological Work by Cleveland Abbe, in Maryland Weather Service, Johns Hopkins Press, Baltimore, 1899. Volume I, page 316.NOAA's National Weather Service (NWS) Collection, Image ID: wea00920. Source link. Direct link to image .Public Domain.

PLENTY OF WEATHER TO CAPURE



Screenshot from Google Earth, reproduced in compliance with Google's fair use for non-commercial purposes policy.

THE OREGON SCIENTIFIC WMR89

Entry level Weather Station featuring,

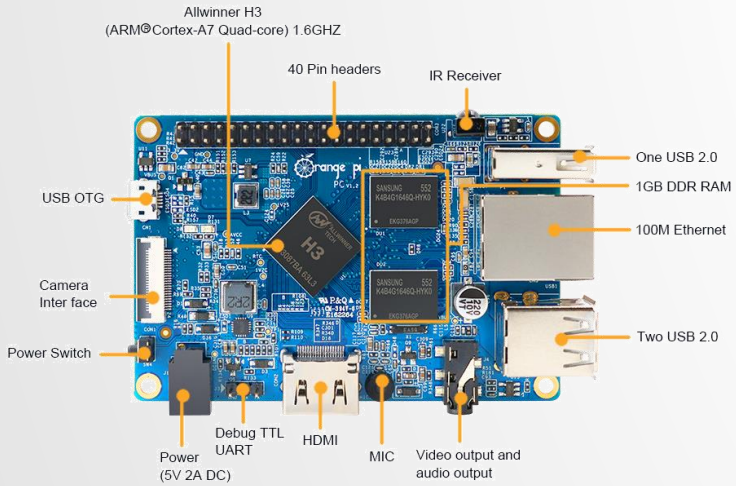
1. Base Station
   - Radio Sync Atomic Clock
   - Barometer
   - USB Port
2. Anemometer (WGR800)
3. Temperature Sensor (THGR810)
4. Rain Gauge (PCR800)

Pretty cool but,

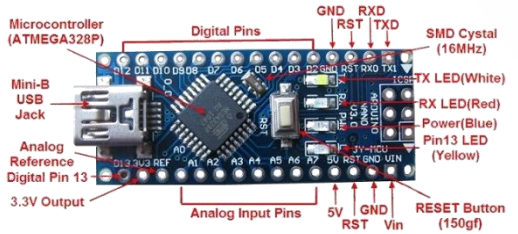
- Windows only software ⇒ $
  (No support in WeeWX, WVIEW etc)

- Unreliable wireless receiver
  (even in ideal conditions)

HARDWARE COMPONENTS



Orange PI PC (€15)

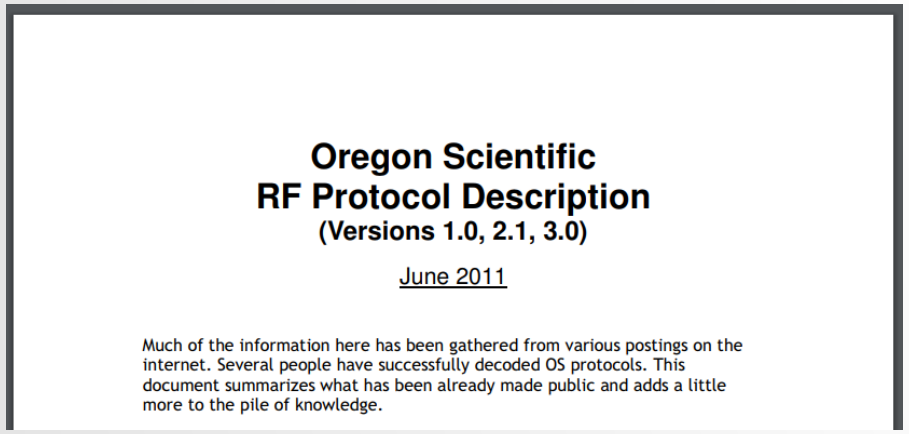


Arduino Nano Clone (€2.50)

RXB6 433Mhz Receiver (€2)

1 - Antenna
2 - GND
3 - GND
4 - VCC
5 - VCC
6 - DER
7 - DATA
8 - GND

SOFTWARE COMPONENTS

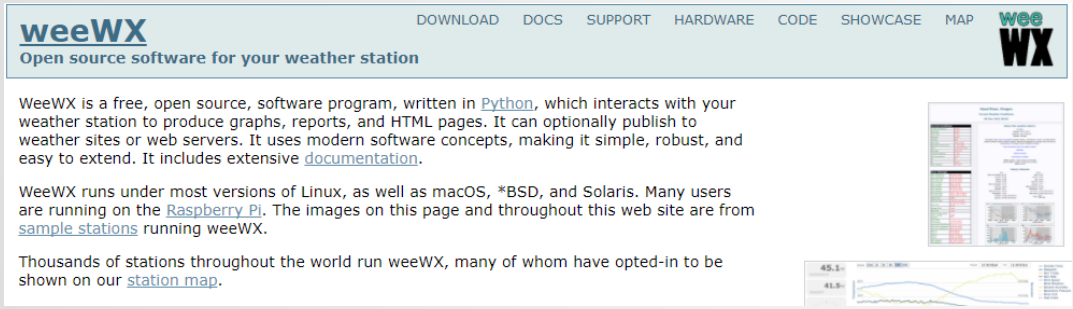


Oregon Scientific
RF Protocol Description
(Versions 1.0, 2.1, 3.0)

June 2011

Much of the information here has been gathered from various postings on the internet. Several people have successfully decoded OS protocols. This document summarizes what has been already made public and adds a little more to the pile of knowledge.

The Oregon Scientific RF Protocol Description



weeWX
Open source software for your weather station

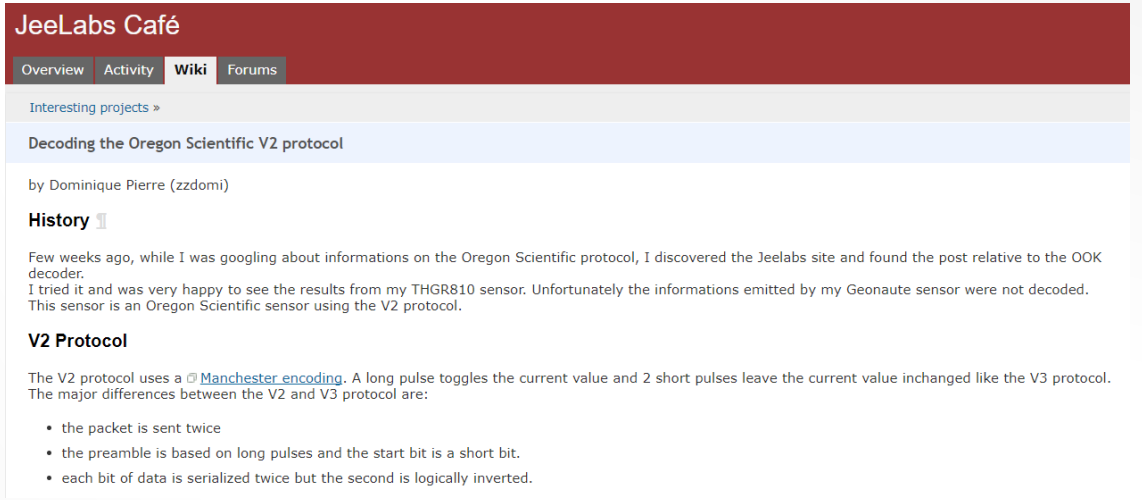
DOWNLOAD DOCS SUPPORT HARDWARE CODE SHOWCASE MAP

WeeWX is a free, open source, software program, written in Python, which interacts with your weather station to produce graphs, reports, and HTML pages. It can optionally publish to weather sites or web servers. It uses modern software concepts, making it simple, robust, and easy to extend. It includes extensive documentation.

WeeWX runs under most versions of Linux, as well as macOS, *BSD, and Solaris. Many users are running on the Raspberry Pi. The images on this page and throughout this web site are from sample stations running weeWX.

Thousands of stations throughout the world run weeWX, many of whom have opted-in to be shown on our station map.

WeeWX, GPL v3 License, Tom Keffer (and Will Page)
Open source software for your weather station



JeeLabs Café

Overview Activity Wiki Forums

Interesting projects »

Decoding the Oregon Scientific V2 protocol

by Dominique Pierre (zzdomi)

History

Few weeks ago, while I was googling about informations on the Oregon Scientific protocol, I discovered the Jeelabs site and found the post relative to the OOK decoder.
I tried it and was very happy to see the results from my THGR810 sensor. Unfortunately the informations emitted by my Geonaute sensor were not decoded.
This sensor is an Oregon Scientific sensor using the V2 protocol.

V2 Protocol

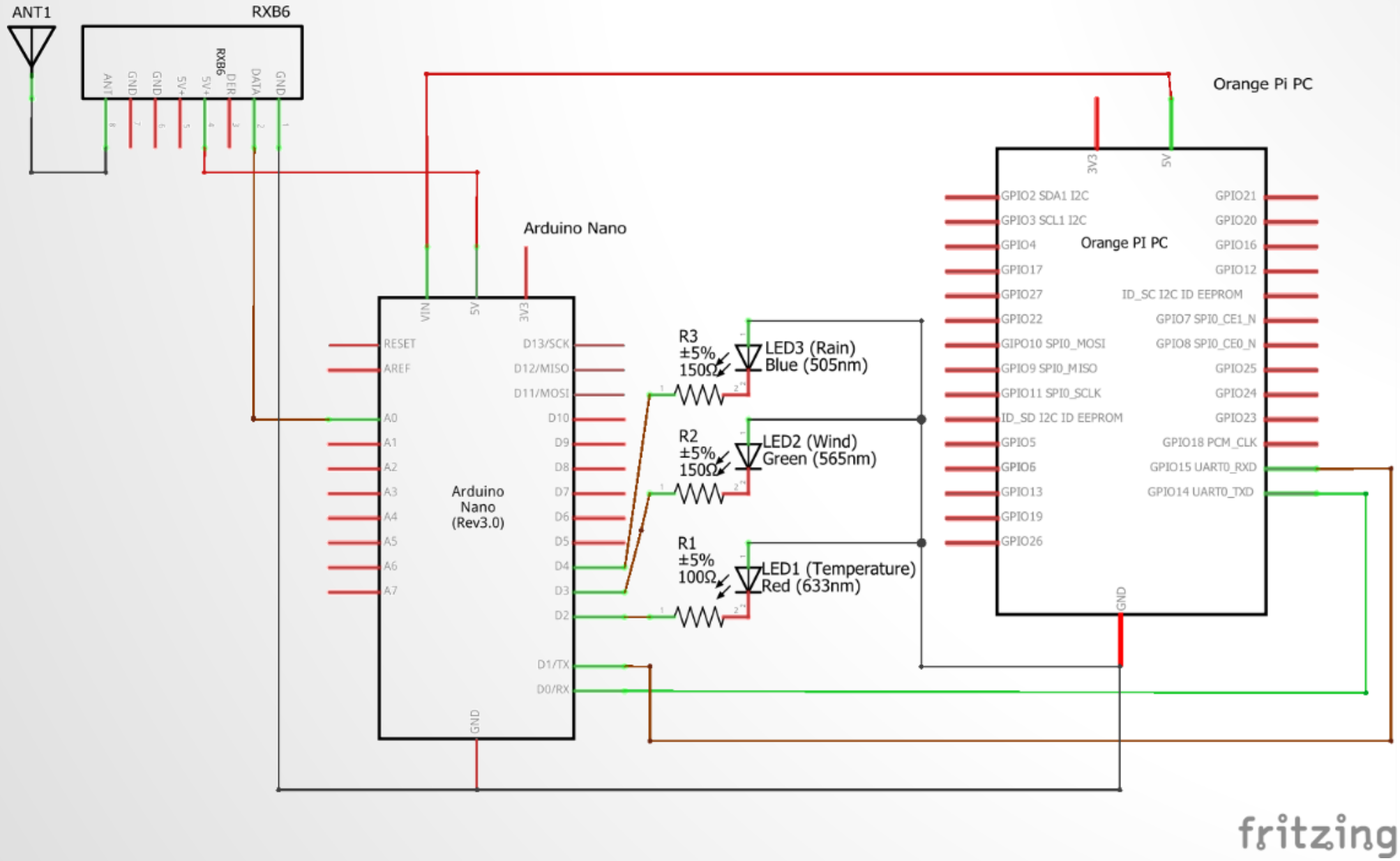
The V2 protocol uses a Manchester encoding. A long pulse toggles the current value and 2 short pulses leave the current value inchanged like the V3 protocol.
The major differences between the V2 and V3 protocol are:

- the packet is sent twice
- the preamble is based on long pulses and the start bit is a short bit.
- each bit of data is serialized twice but the second is logically inverted.

Decoding the Oregon Scientific V2 protocol
Ook_OSV2.pde, MIT License, Dominique Pierre

Initial Arduino Sketch, implements Manchester encoding for RXB6 433Mhz Receiver

CIRCUIT DIAGRAM



DECODING THE BITSTREAM

Anemometer (WGR800)

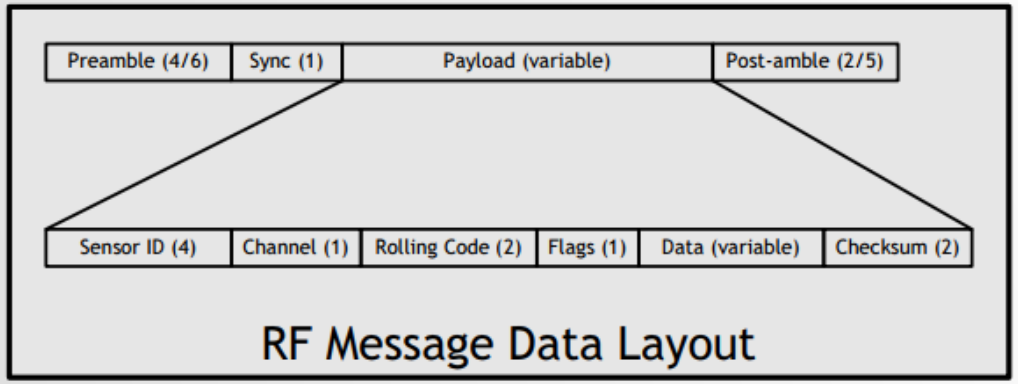


Figure 1. Layout of version 2.1 and 3.0 messages

0	1	2	3	4	5	6	7	8	9	10
1A	89	04	F1	30	C0	25	10	02	3F	6B

Sensor ID

- Nibble orientated bitstream, lower nibble is first. e.g. Sensor ID 1A89 (bytes) equals A198 (nibbles).
- Sensor ID: A198 is not listed in the OS Protocol Document, listed ID for WGR800 is 1984?
- Checksum is always incorrect, always seems to be out decimal 10 (Hex 0xA).

BEWARE OF ASSUMPTIONS

DECODING THE BITSTREAM (2ND ATTEMPT)

Anemometer (WGR800)

0	1	2	3	4	5	6	7	8	9	10
1A	89	04	F1	30	C0	25	10	02	3F	6B

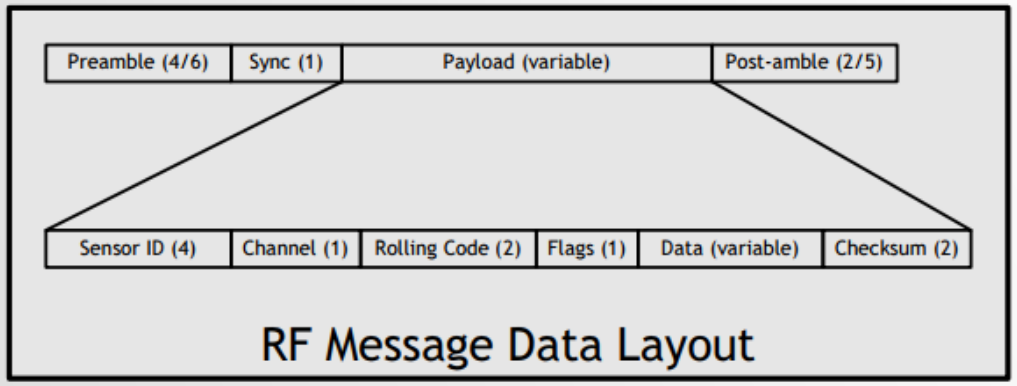


Figure 1. Layout of version 2.1 and 3.0 messages

2. A sync nibble (4-bits) which is “0101” in the order of transmission. With v2.1 sensors this actually appears as “10011001”. Since nibbles are sent LSB first, the preamble nibble is actually “1010” or a hexadecimal “A”.

Anemometer (WGR800)

0	1	2	3	4	5	6	7	8	9	10
91	48	10	F1	0f	05	4c	02	f0	73	6B

Sensor ID

NEW SOFTWARE

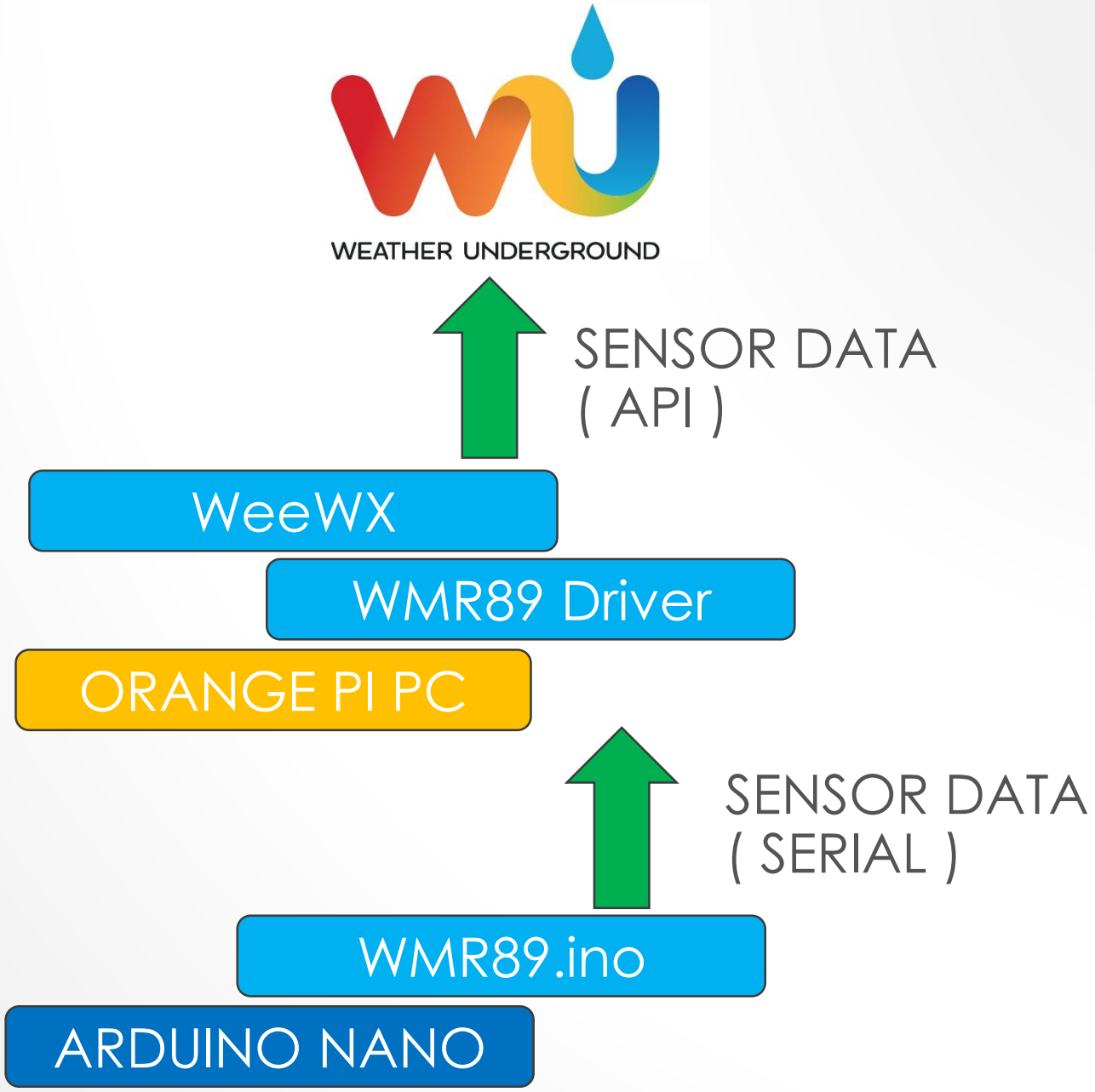
WMR89.ino

- Sketch for the Arduino mini based on Ook_OSV2.pde by Dominique Pierre
- Ignores the sync bits.
- More robust, improved interrupt handling.
- Variable output
  - Output to USB Serial or Arduino RX/TX pins.
  - Output to in ASCII (debug) or Binary.
- Sensors Identification
  - Sensor specific bit stream lengths.
  - Triggers LED with valid sensor data.

WMR89 Driver for WeeWX

- For the WeeWX running on the Orange Pi PC.
- New driver is based on the original WMR9x8 Driver in WeeWX.
- Parses the sensor data from the WMR89.ino and converts it to WeeWX format.

SENSOR DATA'S JOURNEY TO THE CLOUD



CURRENT STATUS

RFC v1 Posted to the WeeWX community 20/12/2017

Then about a month later …

mwall

☆ ray,

'marunio' over at wxforum figured out that the baud rate on the wmr89 is non-standard. that is why no one has been able to make any sense of the comms.

now that we know the baud rate (128000) it should be pretty easy to make a weewx driver for the wmr89. it looks like the communications protocol is similar to those of other wmr stations.

if you could do some usb captures at the 128000 baud rate, that would help to cover the corner cases.

m

RFC v2 To also support talking to the base station directly is WIP.

LEARNINGS

- Always challenge your own assumptions.
- Always be willing to adapt.

THANK YOU!

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Web: ashroe.eu