W1RETAP

A One-wire sensor logging application

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Introduction

Overview

w1retap is a system for logging data from 1-wire sensors to either a relational database or files (or combination thereof).

w1retap supports any number of the following sensors / devices from AAG Electrónica (AAG) based on Dallas Semiconductors devices:

- TAI8520 (DS1820 / DS18S20) Temperature sensors;
- TAI8540B (DS2438) Humidity Sensor;
- TAI8570 Pressure Sensor (DS2406);
- TAI8575 Rain Gauge (DS2423 Counter);
- TAI8515 Weather Station (DS2423,DS18S20,DS2450);
- DS2409 Microlan coupler;
- DS2760 voltage / current / temperature;
- DS2450 Quad A/D Converter;
- DS2490 USB adaptor;
- DS1921 Thermochron, instantaneous temperature only;
- DS1923 Hygrochron, instantaneous temperature and humidity only;
- DS2480 Serial adaptor;
- LinkUSB adaptor.

w1retap also supports a number of other sensors, typically "hobby/build your own" and some products from HobbyBoards:

- SHT11 based humidity sensor http://home.kpn.nl/thomas_7/1Wire/1-WireIOPort.html;
- MPX4115A based pressure sensor ('fronted' by DS2438) http://home.comcast.net/~andrew.g.miller/barometer/ ;
- MS-TH Humidity sensors (and temperature) based on DS2438 / Honeywell HiH400). This also supports the Hobby Boards Humidity / Temperature sensor;
- The Hobby Boards Pressure sensor;
- The Hobby Boards Solar sensor (and permutations);
- The Hobby Boards UltraViolet sensor;
- The iButton MS-TC Temperature and Current sensor.

w1retap is flexible in the way that 1-wire sensor data is logged; a system of "plugin" modules allow the user to choose the most appropriate logging method. Currently supported logging modules are:

- Sqlite (version 3);
- PostgreSQL;
- MySQL;
- ODBC;
- Mongodb
- Text file;
- CSV file;
- XML file.

w1retap is designed to run on the Linux operating system and assumes that the interface between the computer and the 1-wire system is either a DS2490 USB adaptor or a DS2480 RS232 serial adaptor.

Porting to any other operating system that supports the Dallas SDK, the gcc compiler and dynamically loadable modules should also be possible.

A modified Dallas public domain 1-wire SDK is included in its entirety, and may be built from `makefile.shrlib`. This will build all the Dallas sample applications, which may be useful for troubleshooting.

The standard **w1retap** installation includes a program `w1find` which detects devices on the 1-wire network and may be used as a basis for the sensor configuration table / file.

w1retap does not in itself offer any graphical user interface, however there is a `contrib` directory that contains scripts to build web pages, and a GNOME panel applet.

Unless otherwise indicated, the software is released under the GNU Public Licence.

This document is applicable to the w1retap 1.4.1 (and later) releases.

w1retap is known to build and run on ARM, ia32, x86_64 and PPC architectures.

Organisation of the w1retap release

The **w1retap** release is organised into a number of sub-directories:

This distribution is organised as:

src	Contains the **w1retap** software.
src/libusblinux300	The Dallas PD 1-wire SDK
doc	Documentation on configuring and using **w1retap**
contrib	Various scripts and applications, including a web page builder, a wunderground.com reporting script, RSS feeder, and GNOME panel applets.

Installation

Choosing the logging method

Installation of **w1retap** requires that the software is compiled from source, you may first wish to decide which backend logging modules you are going to use (however the build system will build all those it can on your machine). These are build as loadable modules (shared libraries) and include:

Type	Name	Module
Sqlite (version 3)	w1sqlite	`libw1sqlite.so`
PostgreSQL	w1pgsql	`libw1pgsql.so`
MySQL	w1mysql	`libw1mysql.so`
Mongodb	w1mongo	`libw1mongo.so`
ODBC	w1odbc	`libw1odbc.so`
Text file	w1file	`libw1file.so`
CSV file	w1csv	`libw1csv.so`
XML file	w1xml	`libw1xml.so`

For each of the RDBMS loggers, you will need to have the relevant development files (header files and libraries installed). The file based modules have no external dependencies (other than libxml2 for w1xml), and you can always use `libw1file.so`, as this can also provide fall back configuration data.

Build Process

w1retap uses `autoconf` and in theory will detect the features that it can build on your machine. Backends can be installed and configured while **w1retap** is running, so you might as well build all you may ever need, assuming you have the dependencies satisfied.

Build and install

Issue the following commands:

```
$ ./configure
$ make
$ sudo make install  # (or run as root).
```

`make install` installs the **w1retap** application into `/usr/local/bin` and its plugins to `/usr/local/lib/w1retap/` with the default `autoconf prefix` setting. To change this, run ./configure with your preferred settings, for example:

```
$ ./configure –prefix=/usr
```

will install the application into `/usr/bin` and the plugin modules to `/usr/lib/w1retap/`.

You can force the installed programs to be stripped with `make install-strip`, however, as far as the author can ascertain, this does not strip the modules. You can force the plugin modules to be stripped with `STRIP_LIBS=yes`, e.g.:

```
$ sudo make install-strip  STRIP_LIBS=yes prefix=/usr
```

In addition to the RDBMS shared libraries, shared libraries are built for USB and RS232 device access.

Configuration Essentials

The configuration comprises two areas:

- Configuration of the 1-wire sensors. This may be file based or in a relational database;
- Configuration of the application. The user running **w1retap** needs to create a

configuration file in their home directory under `.config/w1retap`.

```
$ mkdir -p ~/.config/w1retap
```

- Alternately, a system wide configuration file, `/etc/defaults/w1retap` may be used, or the environment variable W1RCFILE may define the full path of a configuration file. Use of W1RCFILE allows alternate configurations for testing.

The `~/.config/w1retap` directory should contain the file `rc` which configures the application, and optionally `applet` which configures the GNOME applet (see `contrib/w1temp` for details) and, optionally, `sensors` which defines the 1-wire sensors (unless the sensors are defined in a RDBMS). If you are using a data base for logging, it is recommended that you also use it to store the configuration.

Creating the database

If you're using an RDBMS for logging, create the RDBMS from the `docs/mksens.sql` or `docs/mksenst.sql` (depending on how you which to store timestamps) files.

e.g.

```
$ sqlite3 /var/tmp/sensors.db < mksens.sql
```

or

```
$ psql -U USERNAME template1
template1=# create database w1retap;
CREATE DATABASE
template1=# \c w1retap;
You are now connected to database "w1retap".
w1retap=# \i mksenst.sql
CREATE TABLE
CREATE TABLE
CREATE TABLE
CREATE TABLE
w1retap=# \q
```

or

```
mysql -u USERNAME -p
mysql> create database w1retap;
Query OK, 1 row affected (0.02 sec)
mysql> use w1retap
Database changed
mysql> source mksens.sql
Query OK, 0 rows affected (0.01 sec)
Query OK, 0 rows affected (0.13 sec)
Query OK, 0 rows affected (0.02 sec)
Query OK, 0 rows affected (0.09 sec)
mysql> quit
```

Note that MySQL uses a somewhat strange SQL syntax, and you may need to modify the template files (or the included MySQL example).

Creating a Mongodb database

The implementation of Mongo largely follows the configuration for an SQL RDBMS. In particular, the database defualts to 'wx', and the configuration collections must be named 'w1sensors' and 'ratelimit', with the documents in each having the same fields as for the SQL equivalent:

```
$ mongo piglet/wx
MongoDB shell version: 2.0.2
connecting to: piglet/wx
PRIMARY> db.w1sensors.find().limit(1)
{ "_id" : ObjectId("4ef39490a9781d5b11000002"), "device" : "105EE02301080039",
"type" : "DS1820", "abbrv1" : "STMP1", "name1" : "Soil Temperature", "units1" : "°C",
"abbrv2" : null, "name2" : null, "units2" : null, "params" : null, "interval" : null }
PRIMARY> db.ratelimit.find().limit(1)
{ "_id" : ObjectId("4ef39491a9781d5b110009fd"), "name" : "GHT", "value" : 2.5,
"rmin" : null, "rmax" : null }
```

w1retap will write to collections 'readings' and optionally, 'replog'. These collections do not have to exist.

Both standalone mongodb instances and replica sets are supported. **w1retap** uses the libmongo-client library (available in the ArchLinux AUR, but you'll probably need to build from the git source <https://github.com/algernon/libmongo-client> on other distributions).

Configuration of sensors

w1retap supports any number of the following sensors from AAG Electrónica (AAG) and others, based on Dallas Semiconductors devices. The following devices require configuration.

- TAI8520 (DS1820 / DS18S20) Temperature sensors;
- TAI8540B (DS2438) Humidity Sensor;
- TAI8570 Pressure Sensor;
- TAI8575 Rain Gauge;
- TAI8515 Weather Station (Wind Vane);
- DS2760 voltage / current / temperature;
- DS2450 Quad A/D Converter;
- DS2409 Microlan coupler;
- DS1921 Thermochron, instantaneous temperature only;
- DS1923 Hygrochron, instantaneous temperature and humidity only;
- SHT11 Humidity sensor;
- MPX4115A based pressure sensor ('fronted' by DS2438);
- MS-TH Humidity sensors (and temperature) based on DS2438 / Honeywell HiH400). This also supports the Hobby Boards Humidity / Temperature sensor;
- The Hobby Boards Pressure sensor;
- The Hobby Boards Solar sensor;
- The Hobby Boards UV sensor;
- iButtom MS-TC Current / Temperature sensor.

Unlike some advanced 1-wire applications, your sensors are not fully auto-detected. You need to either populate the w1sensors table in the RDBMS or create a delimited configuration file `~/.config/w1retap/sensors`.

The w1sensors table and the `~/.config/w1retap/sensors` file both contain the same

information, from the table:

```
CREATE TABLE w1sensors
(
	device text,
	type text,
	abbrv1 text,
	name1 text,
	units1 text;
	abbrv2 text,
	name2 text,
	units2 text,
	params text,
	interval integer
);
```

For each sensor, we need:

Device The device address. If you have sensors from AAG, then the address will be printed on the case, otherwise, you can use the **w1find** program to detect the devices.

Type A description of the sensor type. This defines how **w1retap** will access the device. One of:

- DS1820 (DS1820/DS18S20/DS1920 Temperature sensors);
- TAI8540 (AAG Humidity sensors);
- TAI8570 (AAG Pressure sensors);
- TAI8575 (AAG Rain Gauge);
- SHT11 (SHT11 Humidity sensors);
- MPX4115A (“Bray” barometer);
- TAI8515 (“Weather” station);
- DS2409 (Microlan coupler);
- DS2450 (Quad A / D Converter);
- DS2438 (raw voltages);
- HB-BARO (Hobby Board Barometer);
- MS-TH or HWHIH (MS-TH / Honeywell humidity sensors);
- DS2760 voltage / current / temperature sensor (high-precision li+ battery monitor);
- DS1921 Thermochron;
- DS1923 Hygrochron;
- MS-TC (iButton Current / Temperature);

- HB-UV (Hobby Boards UV).

In previous versions a generic name was allowed (“Temperature”, “Pressure”, “Humidity” etc.). These generic names are deprecated and support for generic names will be removed in some future version (specifically, in 1.29).

Name	An arbitrary name of a function of the device.
Abbrv	An unique abbreviation (essentially a key) that identifies the device readings in the database.
Units	The units that the device records.
Params	Any special parameters used by the application to convert readings from the device to meteorological data. This is typically required for some pressure sensors.
Interval	Optional, defines the polling interval for the sensor.

It had, during early development, been erroneously assumed that each device supports one or two functions, each of these is identified by an arbitrary name, an arbitrary (but unique) abbreviation and the units of measurement that the device records in. The presence of the abbreviation field determines if that specific function is logged. Where a device supports two or more functions, for example humidity and temperature, or pressure and temperature, then it is a requirement that the 'name' field describes the function.

Where a device supports more than two functions, it is just necessary to add any additional definition with the same device name and device type for those additional functions. This allows the voltages from a DS2438 incorporated in a humidity sensor to be logged, or the four functions from a DS2760.

So, for example: I have a TAI8570 Pressure Sensor. This actually contains two 1-wire devices, we need to specify the address of the "reader" device. As well as being printed on the case, this was the first address found by the `w1find` program. There have been reports that the address printed on the cases of some devices in not the “reader “ device; the solution is simple ... w1find will find both addresses, if one doesn't work the try the other one!

So my configuration for this device is:

```
device      = 12FC6B34000000A9
type        = Pressure
abbrv1      = OPRS
name1       = Pressure
units1      = hPa
abbrv2      = OTMP1
name2       = Temperature
units2      = °C
```

This information may either be stored in a database in the w1sensors table, or in the `.config/w1retap/sensors` text file (as : or | delimited values):

e.g.: **SQL:**

```
INSERT INTO "w1sensors" VALUES('12FC6B34000000A9', 'Pressure', 'OPRS', 'Pressure',
'hPa', 'OTMP1', 'Temperature', '°C',NULL);
```

or, **.config/w1retap/sensors:**

```
12FC6B34000000A9:Pressure:OPRS:Pressure:hPa:OTMP1:Temperature:°C
```

For my complete station:

```
INSERT INTO w1sensors (device, "type", abbrv1, name1, units1, abbrv2, name2,
units2, params) VALUES ('286DA467000000AD', 'DS1820', 'GHT', 'Greenhouse
Temperature', '°C', NULL, NULL, NULL, NULL);
INSERT INTO w1sensors (device, "type", abbrv1, name1, units1, abbrv2, name2,
units2, params) VALUES ('10A942C10008009B', 'DS1820', 'OTMP0', 'Outside
Temperatue', '°C', NULL, NULL, NULL, NULL);
INSERT INTO w1sensors (device, "type", abbrv1, name1, units1, abbrv2, name2,
units2, params) VALUES ('1093AEC100080042', 'DS1820', 'XTMP2', 'Garage
Temperature', '°C', NULL, NULL, NULL, NULL);
INSERT INTO w1sensors (device, "type", abbrv1, name1, units1, abbrv2, name2,
units2, params) VALUES ('26378851000000AB', 'TAI8540', 'OHUM', 'Humidity', '%',
'OTMP2', 'Garage Temperature', '°C', NULL);
INSERT INTO w1sensors (device, "type", abbrv1, name1, units1, abbrv2, name2,
units2, params) VALUES ('12FC6B34000000A9', 'TAI8570', 'OPRS', 'Pressure', 'hPa',
'OTMP1', 'Temperature', '°C', NULL);
INSERT INTO w1sensors (device, "type", abbrv1, name1, units1, abbrv2, name2,
units2, params) VALUES ('1D9BB10500000089', 'TAI8575', 'RGC0', 'Counter0', ' tips',
'RGC1', 'Counter1', 'tips', NULL);
```

or (lines starting # are comments, old set of sensors, deprecated device names)

```
$ cat ~/.config/w1retap/sensors
# Device:Type:Abbrv1:Name1:Units1:[Abbrv2:Name2:Units2]
286DA467000000AD:Temperature:GHT:Greenhouse Temperature:°C:::
2692354D00000095:Humidity:OHUM:Humidity:%:OTMP0:Temperature:°C
12FC6B34000000A9:Pressure:OPRS:Pressure:hPa:OTMP1:Temperature:°C
1D9BB10500000089:RainGauge:RGC0:Counter0:tips:RGC1:Counter1:tips
```

Note that the greenhouse temperature sensor only has one function, so the abbrv2, name2 and unit2 fields are not defined (or NULL). None of the devices require a params field.

Multi-function sensors

Devices incorporating the DS2438 and the DS2760 (inter alia) may provide more than the two functions that the w1retap database schema appears to permit. This has been addressed in w1retap v1.2.2 and later; when w1retap reads the w1sensors table (or configuration file), it will group functions by Device ID and device type. This means that for a DS2760 that supports four functions, we can define the functions using two rows, and all the data will be read in one place, for example:

```
INSERT INTO w1sensors VALUES ('30EB9B6112000018','DS2760', 'MS_Volts','Moisture
Voltage','V','MS_Current','Moisture Current','A',NULL);
INSERT INTO w1sensors VALUES ('30EB9B6112000018','DS2760', 'MS_Temp','Moisture
Temperature','°C','MS_Accum','Moisture Accumulator','Ahrs',NULL);
```

For a DS2438, there are two options if you want the voltages as well as the 'applied' device (e.g. a TAI8540 humidity sensor); you could just define everything as the 'applied' device, which causes one read of the device, e.g.

```
26378851000000AB|TAI8540|OHUM|Humidity|%|OTMP0|Outside Temperature|°C|
26378851000000AB|TAI8540|Vdd|Vdd|V||||
```

```
26378851000000AB|TAI8540|Vad|Vad|V|Vsens|Vsens|mV|
```

or as two devices, which is less efficient, as the device is read twice:

```
26378851000000AB|TAI8540|OHUM|Humidity|%|OTMP0|Outside Temperature|°C|
26378851000000AB|DS2438|Vdd|Vdd|V||||
26378851000000AB|DS2438|Vad|Vad|V|Vsens|Vsens|mV|
```

Complex sensors (Coupler / Parameters)

If you have DS2409 Microlan couplers or a MPX4115A based pressure sensor, your configuration requires a little more work:

Microlan

For a Microlan device, it is necessary to add an entry for each device that is connected via the coupler. The **w1find** application will display the devices on each branch, but it is necessary to add an entry for each device. For each of these entries, the device field is address of the DS2409 coupler, the abbrv1 field is set to 'MAIN' and the abbrv2 filed is set to 'AUX'. The name1 field is a device id on the main branch, the name2 field is the name of a device on the auxiliary branch. Please see the meteo-sensors.csv file in the documentation directory. I know this is ugly, and an automated tool (w1sensors.rb) is included with w1retap 1.24 and later to address this. Alternately, each coupler may be defined once, and the devices on the main and aux branches listed as space separated lists in the abbrv1 and abbrv2 fields respectively. See the daria.co.uk-single.sql and daria.co.uk-multi.sql listings in the documentation directory.

MPX4115A

In order to convert the voltage readings from the MPX4115A's DS2438 sensor into pressure (which is assumed linear), values of the slope and offset in an equation:

pressure (hPa) = slope x Vout + offset

where Vout is the sensed (output) voltage. These values will depend on the components used and whether an OpAmp is included in the design. By default slope= 35.95 and offset = 751.08. As these values probably don't work for any real device, “correct for your setup” values may be provided as a set of space separated numbers in the params field (as many as are necessary for any particular device; not limited to the MPX4115A / DS2438 combination).

HB-BARO

The HobbyBoards barometer works in a similar fashion to the MPX4115A 'Bray' device, in that a slope and offset are used to convert the Vad voltage from the DS2438 into a pressure reading. Please note that:

- The device calibration is defined by the vendor in terms of imperial units (inHg), rather than the SI units (hPa) used in the majority of the world, thus;
- The default slope and offset in w1retap are those from the HB-BARO documentation for sea-level (slope 0.6562, offset 26.0827). These, alas, give a value in inHg, which w1retap multiplies by 33.863886 to give hPa;

- Alternatively, you can specify the parameters in SI (for hPa) by multiplying the vendor supplied values by 33.863886. This makes correcting the calibration by adjustment of offset (the usual case) simpler, as one merely adds or subtracts the hPa difference from the offset.
- The design of the HB-BARO assumes that the altitude correction is embodied in the slope / offset, and w1retap does not compensate for altitude (it compensates for altitude and temperature for the other barometer devices);
- If you wish to use your own parameters, you must take into account the inHg to hPa conversion factor. For example, if your device, at sea level, consistently over-reads by 6hPa, then you would reduce the offset by (6.0/33.863886), giving an offset of 25.90552 compared to the default 26.0827. If you have specified the calibration values as SI units, then you would just subtract 6 from the SI value (i.e. original offset 883.26, modified offset 877.26). In the author's experience, the device is delivered with an accurate calibration voltage, but the offset may need adjusting (by -3 hPa for the author's device);
- For purposes of calibration, by adding an additional configuration entry for the measured voltage (Vad), you can use w1retap to perform the manufacturer's documented calibration steps (see HobbyBoards' web site).

HB Solar The Hobby Boards Solar sensor is a DS2438 that provides the output of the photo-diode as the 'Vsens' voltage. The thread at http://www.cocoontech.com/index.php?showtopic=6452&hl=solar provides conversion data. From this, with the standard HB device, multiplying the millivolts from w1retap by 2.9682 gives W/m^2; albeit possibly an underestimate if you're using parasitic (vice external) power.

DS1921 If a mission is running, the last recorded mission value is returned, if no mission is running, then a forced temperature conversion is run on the device, giving the instantaneous temperature. If the params value for the device is set to a numeric value, then any extant mission is aborted and the instantaneous temperature returned.

DS1923 If the params value for the device is set to a numeric value, then any extant mission is aborted before the device is read.

DS2423, TAI8575 The params value may consist of two integers that are **added** to the readings (so if you want to subtract, make the param values negative). This is useful if you change the counter, but wish to maintain reported values.

HB-UV The HobbyBoards UV sensor has a number of settings stored in non-volatile memory. These can be set using the **hbuvtest** tool, running **hbuvtest -h** describes how to view or alter the nv-ram settings.

An example complex configuration with an MPX4115A and DS2409 is:

```
INSERT INTO w1sensors (device, type, abbrv1, name1, units1, abbrv2, name2, units2,
params) VALUES ('106B89C4000800B9','DS18S20','DS1820 Temp',
'Temperature','°C',NULL,NULL,NULL,NULL);
INSERT INTO w1sensors (device, type, abbrv1, name1, units1, abbrv2,
```

```
name2, units2, params) VALUES ('264E1169000000B5','MPX4115A',
'Baro Press','Pressure','hPa','Baro Temp','Temperature','°C',
'34.249672152 762.374681772');
INSERT INTO w1sensors (device, type, abbrv1, name1, units1, abbrv2, name2, units2,
params) VALUES ('01F8A3880E0000A2','SHT11','SHT11 RH','Humidity','%',
'SHT11 Temp','Temperature','°C',NULL);
INSERT INTO w1sensors (device, type, abbrv1, name1, units1, abbrv2,
name2, units2, params) VALUES
('1FCD2D020000007F','DS2409','MAIN','264E1169000000B5',NULL,'NULL',
NULL,NULL,NULL);
INSERT INTO w1sensors (device, type, abbrv1, name1, units1, abbrv2,
name2, units2, params) VALUES
('1FCD2D020000007F','DS2409','NULL,'NULL',NULL,'AUX',
'01F8A3880E0000A2',NULL,NULL);
```

In this example, the final sensor is the Microlan coupler, the name fields define a sensor on each branch. The MPX4115A “Bray” barometer uses specific slope and offset parameters from the params field (c.f. the HB_BARO).

TAI8518 Weather Station

The TAI8515 Weather Station from AAG provides temperature and wind speed and direction. These components are provided by three separate one wire devices in the TAI8515, e.g.:

```
201A1B01000000F8   2450:quad a/d converter                  -> wind direction
10EF161400080056   18S20:high precision digital thermometer -> air temp
1DA273010000005D    2423:4k ram with counter                -> wind speed
```

These devices would be defined by three separate entries in the configuration file, for example:

```
INSERT INTO w1sensors VALUES ('10EF161400080056','DS18S20','DS1820 Temp',
'Temperature','°C',NULL,NULL,NULL,NULL);
INSERT INTO w1sensors VALUES ('201A1B01000000F8','TAI8515','WDIR',
        'Wind Direction', '',NULL,NULL,NULL,NULL);
INSERT INTO w1sensors VALUES ('1DA273010000005D','DS2423','WSPD',
        'Wind Speed', '',NULL,NULL,NULL,NULL);
```

The temperature will be returned in °C, the direction as an integer in the range 0-15, which you must interpret as a direction N,NNE,NE ... NNW etc, and the speed as a counter value. The AAG web site FAQ provides a formula for converting counts per time interval to wind speed <http://www.aagelectronica.com/aag/en-us/pg_10.html#Q16>.

Summary of device type naming

The following device 'type' keys are recognised in the w1sensors table or sensors configuration file (second parameter).

Type	Alternatives	Deprecated	Device Function
DS1820	DS18S20	Temperature	DS1820,DS18S20, DS1920 temperature sensors.
TAI8540		Humidity	TAI8540 (DS2438 based) Humidity sensor.
TAI8570		Pressure	TAI8570 Pressure sensor (dual DS2406).
DS2423	Counter, TAI8575	RainGauge	DS2423 Counters.
MPX4115A		Bray	Barometer based on MPX4415A (with DS2438).
SHT11			SHT11 based humidity sensor.
TAI8515	Windvane, Weathervane		AAG Weather station wind direction sensor (DS2450 based).
DS2490	Coupler		DS2409 Microlan Coupler.
DS2438		Voltage	DS2438 as a voltage sensor
HB-BARO	HB_BARO		Hobby Boards Barometer
MS-TH	HWHIH		MS-TH Humidity Sensor (also works for Hobby Boards Honeywell HIH4000 based humidity sensor).
DS2760			DS2760 voltage / current / temperature.
DS2450			Quad A / D Converter
MS-TC			iButton current and temperature.
DS1923			DS1923 Hygrochron, instantaneous temperature and humidity only
HB-UV	HB_UV		Hobby Boards ultra-violet.

The following device 'name' keys are required in order to get data from multi-function sensors stored corrected in the database. The match is partial; the quoted text must occur somewhere in the 'nameN' field. For w1retap v1.24 and later, the quoted text may alternately be given precisely as the abbrvN field. The match is case independent in both instances.

Device key	Name key	Usage
MPX4115A / Bray or HB-BARO or TAI8570	Pres	Pressure Value
	Temp	Temperature Value
SHT11 or TAI8540 or MS-TH / HWHIH	Humidity	Humidity Value
	Temp	Temperature Value
DS2438 (or TAI8540 or other DS2438 based sensor [Bray, HB-BARO etc]).	Vdd	Supply voltage
	Vad	Output voltage
	vsens	Sensed voltage
	Temp	Temperature Value
DS2760	Volt	Voltage (V)
	Current	Current (I)

Device key	Name key	Usage
	Accumulator	Amp hr
	Temp	Temperature Value
DS2450	ADx	i.e. ADA, ADB, ADC, ADD. Two entries are necessary to define all the A/D converters. This is only necessary for a standalone DS2450. The device included in the AGG Wind-vane is read directly by the TAI8515 entry.
MS-TC (DS2438 based iButton current sensor) Note: Only the current and temperature are useful outputs.	current	Measured current
	Vdd	Supply voltage
	Vad	Output voltage
	vsens	Sensed voltage
	Temp	Temperature Value
DS1921	Temp	Temperature Value
DS1923	Temp	Temperature Value
	Humidity	Humidity Value
HB-UV	Temp	Temperature Value
	uv	UV value
	ultra	UV value
	violet	UV value

Database and storage strategies

The default database schema writes a record for each reading (a tuple of date, sensor name and the sensor value), whereas mongodb is a documented oriented store and stores a “document” (in fact a JSON data structure) containing all readings at a particular timestamp. From **w1retap** 1.41, it is also possible to use a document oriented strategy with PostgreSQL and SQLite databases.

Database storage and performance configurations

The author initially ran **w1retap** on a record orientated PostgreSQL implementation, then for six months on mongodb (w1retap 1.4.0), and is now back to PostgreSQL, with a document orientated storage strategy. There are a number of advantages and disadvantages to each scheme, a document oriented strategy greatly reduces the number of records (I have 10 sensors, so for sensor pass, that's one record in the document oriented database vice ten in the record orientated store. Likewise, for display, retrieving all records within a set time period requires far records to be returned, as a modern scripting languages handle JSON efficiently, this can result is a much more efficient application. The only downside is perhaps in retrieving a particular record on a none-timestamped criteria.

For example the coldest every outside temperature reading (OTMP0 here), using the record schema,

```
select * from readings where name='OTMP0' order by value asc limit 1;
```

is pretty straight forward, whereas the this search is either more difficult or impossible in an RDBMS with a document storage. PostgreSQL adds a JSON data type in version 9.2, but this can be emulated in earlier versions with a text column. The use of the plv8 language extension (Google's v8 javascript interpreter as a postgresql extension lanuage), and the postsql.sql functions from <https://github.com/tobyhede/postsql> can make this work with document storage (and by hacking the postsql functions, it works with versions earlier than 9.2 using a text field rather than a json field).

```
wx=# select * from readings order by json_float(wxdata,'OTMP0') limit 1;
  2010-12-26 07:16:00+00 |
{"CFRAME1":5.1875,"GHT":6.0625,"OHUM":93.447586,"OPRS":1030.93689,
"OTMP0":-8.0625,"OTMP1":16.65625,"OTMP2":-3.8125,
"RGC0":19793.0,"RGC1":16219.0,"SOLAR":0.0,"STMP1":3.0625}
(1 row)
```

For the record storage I have c. 15 million records, compared to c. 1.6 million with document storage. Whilst the non-temporal search (e.g. for the coldest record) takes longer with the document format (15s v. 5s), returning the last 24 hours readings is much faster for the document format (0.005s v 4s).

Configuring the RDBMS record type

For a record storage schema, the readings table requires the following (bold) as a minimum (you may also add an auto-increment id column, as well as constraints and indices):

```
CREATE TABLE readings (
    date timestamp with time zone NOT NULL,
    name text NOT NULL,
    value double precision ,
    id serial
);
CREATE INDEX readings_date ON readings USING btree (date);
ALTER TABLE ONLY readings
    ADD CONSTRAINT reading_sanity UNIQUE (date, name);
```

For the document oriented schema:

```
CREATE TABLE readings (
    date timestamp with time zone NOT NULL,
    wxdata json
);
ALTER TABLE ONLY readings
    ADD CONSTRAINT readings_pkey PRIMARY KEY (date);
```

For PostgreSQL prior to 9.2 (and for SQLite), the json data type should be replaced by a type of text.

The **w1retap** application introspects the readings table at start-up to determine the storage strategy; it is therefore advisable to use the default table and column names as above.

Using per-sensor “readings” tables

The default database configuration creates a single table “readings” with columns of “date”, “name” (i.e. the abbrv1 and abbrv2 values from the “w1sensors” table) and “value”, the actual data which is coerced to a double precision value.

Some users may prefer to have a per sensor data (readings) table, which is possible if you use the PostgreSQL database backend (patches for other database backends are welcome). In order to use per-sensor readings tables, it is necessary to:

- The abbrv1/2 field is defined with a leading '>' character. The text after the '>' is taken as the table name;
- The table is created with fields of 'date' and 'value'. For sensors returning integer data (WindVane and Counters), the value field may be an integer type, otherwise it should be a double precision floating point.

It is possible to mix the 'one monolithic table' and 'one table per sensor' modes, by definition of the abbrv1/abbrv2 fields.

Using w1find to scan the 1-wire bus

In order to create the sensor configuration table, w1sensors, (or a text file), it is necessary to know the devices on the 1-wire bus. The `w1find` program will find this information. It does not create the configuration table or file, as a particular 1-wire sensor may be employed by a number of different devices.

e.g. For my sensors:

```
 $ w1find DS2490-1
(1) 10A942C10008009B    18S20:high precision digital thermometer
(2) 286DA467000000AD    18B20:programmable resolution digital thermometer
(3) 12FC6B34000000A9    2406:dual addressable switch plus 1k memory
(4) 121B4A3400000030    2406:dual addressable switch plus 1k memory
(5) 26378851000000AB    2438:smart battery monitor
(6) 817E84240000008B    :Serial ID Button
(7) 1D9BB10500000089    2423:4k ram with counter
```

And for Mihail Peltekov's sensors:

```
$ w1find /dev/ttyS0
(1) 106B89C4000800B9    18S20:high precision digital thermometer
(2) 01E3D68A0E0000B9    2401:silicon serial number
(3) 1FCD2D020000007F    2409:microlan coupler
        (Main.1) 264E1169000000B5       2438:smart battery monitor
        ( Aux.1) 01F8A3880E0000A2       2401:silicon serial number
```

The two w1sensors tables described previously relate to these configurations. Note that I am using a DS2490 USB adaptor, while Mihail has a DS2480 serial adaptor.

Using w1sensors.rb with w1find to create an initial w1sensors database table

Configuring the w1sensors table is non-trivial, particularly if you have a large number of sensors, one or more DS2409 couplers, or you are new to one wire devices. This is made more complex by the fact that devices may supply multiple functions, or may serve a function other than the primary function of the device (a DS2438 voltage sensor may serve as a pressure or humidity sensor, a DS2423 counter may serve as the wind speed indicator).

The flexibility of one wire devices also means it is very difficult to automatically probe the device chain and ascertain precisely what the function of every device might be,

and manual confirmation and final configuration of device functions will be required.

It is possible to build an initial configuration for the w1sensors database table (as a set of SQL INSERT statements (or a '|' delimited file with --file-based-config)) using the **w1find** program in conjunction with the **w1sensors.rb** script. The output is written to a file or STDOUT (which may be in turn piped to an RDBMS). Any unrecognised sensors are listed to STDERR.

```
$ w1sensors.rb -?
w1sensors.rb [options] [file|stdin]
e.g. w1find DS2490-1 | w1sensors.rb -o /tmp/w1_sensors-setup.sql
      w1find DS2490-1 | w1sensors.rb | sqlite3 sensors.db
   -f, --file-based-config
   -o, --output FILE
   -?, --help                   Show this message
```

So, for my sensors:

```
$ w1find DS2490-1
(1) 105EE02301080039   18S20:high precision digital thermometer
(2) 10A942C10008009B   18S20:high precision digital thermometer
(3) 286DA467000000AD   18B20:programmable resolution digital thermometer
(4) 12FC6B34000000A9   2406:dual addressable switch plus 1k memory
(5) 121B4A3400000030   2406:dual addressable switch plus 1k memory
(6) 26378851000000AB   2438:smart battery monitor
(7) 817E84240000008B   :Serial ID Button
(8) 1D9BB10500000089   2423:4k ram with counter
```

Piping the results into w1sensors.rb gives the following SQL statements:

```
INSERT into w1sensors values ('105EE02301080039','DS1820','TMP_1','Temperature
#1','°C',NULL,NULL,NULL,NULL);
INSERT into w1sensors values ('10A942C10008009B','DS1820','TMP_2','Temperature
#2','°C',NULL,NULL,NULL,NULL);
INSERT into w1sensors values ('286DA467000000AD','DS1820','TMP_3','Temperature
#3','°C',NULL,NULL,NULL,NULL);
INSERT into w1sensors values ('12FC6B34000000A9','TAI8570','Pressure_4', 'Pressure
4','hPa','TMP_4','Temperature #4','°C',NULL);
INSERT into w1sensors values ('26378851000000AB','DS2438','VDD_6', 'VDD 6','V','TMP_6','Temper-
ature #6','°C',NULL);
INSERT into w1sensors values ('26378851000000AB','DS2438','VAD_6', 'VAD 6','V','Vsens_6','Vsens
#6','mV',NULL);
INSERT into w1sensors values ('1D9BB10500000089','TAI8575','CountA_7','CounterA
#7','pulses','CountB_7','CounterB #7','pulses',NULL);
```

And some editing provides the real w1sensors table, noting that the DS2438 is the front end for a TAI8540 humidity sensor.

```
INSERT INTO w1sensors VALUES('105EE02301080039','DS1820','STMP1','Soil
Temperature','°C',NULL,NULL,NULL,NULL);
INSERT INTO w1sensors VALUES('286DA467000000AD','DS1820','GHT','Greenhouse
Temperature','°C',NULL,NULL,NULL,NULL);
INSERT INTO w1sensors VALUES('12FC6B34000000A9','TAI8570','OPRS','Pressure','hPa','OTMP1','In-
side Temperature','°C',NULL);
INSERT INTO w1sensors VALUES('26378851000000AB','TAI8540','OHUM','Humidity','%','OTMP0','Out-
side Temperature','°C',NULL);
INSERT INTO w1sensors
VALUES('1D9BB10500000089','TAI8575','RGC0','Counter0','tips','RGC1','Counter1','tips',NULL);
INSERT INTO w1sensors VALUES('10A942C10008009B','DS1820','OTMP2','Garage
Temperature','°C',NULL,NULL,NULL,NULL);
INSERT INTO w1sensors VALUES('1093AEC100080042','__DS1820','ITMP1','Propagator1
Temperature','°C',NULL,NULL,NULL,NULL);
```

```
INSERT INTO w1sensors VALUES('10E3EA23010800C9','__DS1820','ITMP2','Propagator2 Temperature','°C',NULL,NULL,NULL,NULL);
```

(Note also two seasonal sensors are “commented out” by prefixing the device type with two underscores).

Configuring the w1retap software.

The main configuration of the application is done via the `~/.config/w1retap/rc` file (or `/etc/default/w1retap` if the user's file doesn't exist).

Some of the options may also be specified on the command line when **w1retap** is invoked. This defines how **w1retap** obtains the sensor configuration and how it performs the data logging.

The file contains a set of key / value pairs; blank lines and unrecognised lines (e.g. #...) are ignored.

e.g.

```
#Init file
#init =  w1sqlite=/var/tmp/sensors.db
#log =  w1sqlite=/var/tmp/sensors.db
#init = w1odbc=DSN=w1retap
init = w1pgsql=dbname=w1retap user=postgres
#init = w1file
#log = w1xml=/tmp/xmllog.txt
#log = w1csv=/tmp/csvlog.txt
log = w1mongo=replica=wxrep,roo,piglet,kanga
log = w1pgsql=dbname=w1retap user=postgres
log = w1file = |/usr/local/bin/pert-log.rb
#log = w1mysql=dbname=w1retap user=jrh host=kanga password=ohsososecret
#timestamp = 1
altitude = 19
device = DS2490-1
#device = /dev/ttyS0
```

Where the keys are:

init	The initialisation data for the sensors, e.g. a database with a w1sensors table, or a file. The value part is the name of a plugin and optionally, parameters (see below).
log	The log database to the readings table, or a file for a file data sink. The value part is the name of a plugin and optionally, parameters (see the section “Log and Init options”).
device	The name of the interface device. For Linux, using the standard USB interface, this defaults to "DS2490-1", for a serial device “/dev/ttySn” where “n” represents a digit.
delay	The delay between successive reading of the the 1-wire bus. All sensors are read in one hit, (prior to 1.27, or see the section Per-sensor polling frequency for 1.27 and later).
daemonise	If set to 1, **w1retap** detaches and runs in the background.
altitude	If the altitude is defined (in **metres**), above mean sea level (MSL), then pressure readings are normalised to MSL, otherwise you get the raw, uncorrected value.
timestamp	If timestamp is set to a non-zero integer value, then the time of the observation in the database 'readings' table (field name 'date') will be stored as SQL TIMESTAMP data. The default is that

the 'date' field is stored as an integer number of seconds since 01 January 1970, UTC (Unix epoch values, also known as 'time_t'). You must ensure that your database table is configured appropriately. If you choose TIMESTAMPs, then you need to consider if this will cause you any time-zone / summer time / daylight saving issues.

logtemp By default, **w1retap** writes the latest sensor values to a file `/tmp/.w1retap.dat`. If you set logtemp to 0, this file is not updated. The file contains, for each sensor, the abbreviation and value and a time stamp (Unix epoch "time_t" and ISO date format):

```
GHT=23.75 °C
OHUM=75.95 %
OTMP0=19.50 °C
OPRS=1012.97 hPa
OTMP1=20.23 °C
RGC0=3517.00 tips
RGC1=3481.00 tips
udate=1122818880
date=2005-07-31T15:08:00+0100
```

“Just an overcast Sunday afternoon in July”.

log_delimter The delimiter for “w1file” logs is by default a space. You can override this here, \escapes are recognised, so \t is TAB.

log_time_t If set to yes, the final field for “w1file” logs is the time_t (numeric seconds since the epoch) log time.

temp_scan The time in milliseconds to allow DS1820 type sensors to acquire the temperature before the device is read. By default, **w1retap** uses a conservative value of 1000 (1 second). The data sheet claims the conversion should not exceed 750ms, which is the value the author has used with success.

pressure_reduction_temp By default, **w1retap** uses a QFF pressure reduction model to reduce the pressure to mean sea level (if the **altitude** key (as above) is defined. If you also set the **pressure_reduction_temp** key to a value in degrees Celsius (°C), then this fixed temperature is used (the QNH model). A value of 15 is the ISA (International Standard Atmosphere) value used for some aviation reports.

force_utc If set to true, then database and other timestamps are as UTC rather than localtime. This setting may be useful if your database is less adept than PostgreSQL in storing time stamps with time zones.

Only the first 'init' entry is used; multiple 'log' entries may be given and are all logged to in the order defined.

Log and Init options

For the log and init options, the information supplied has two parts, separated by an equals sign. The name of the plugin handling that information and any additional information. For a file based plugin, this will be the file name and for a database, the name of the database and any access control parameters.

For each plugin, the usage and parameters are:

w1file This provides basic file system access for configuration and logging. If used as a 'init' parameter, it reads `~/.config/w1retap/sensors` (or supplied filename) for sensor

information as described for file based sensor configuration.

```
e.g.
init = w1file
init = w1file=/etc/w1sensors.dat
```

The first case assumes `~/.config/w1retap/sensors` contains the configuration data, the second explicitly reads `/etc/w1sensors.dat`.
If used as a 'log' parameter, it writes one entry per line to STDOUT or a supplied file name:

```
log = w1file
log = w1file=/tmp/w1file.log
```

The data output is in the format (date abbreviation value units):

```
2005-07-29T18:11:28+0100 GHT 20.312500 ºC
2005-07-29T18:11:28+0100 OHUM 74.050064 %
2005-07-29T18:11:28+0100 OTMP0 17.687500 ºC
2005-07-29T18:11:28+0100 OPRS 1009.950562 hPa
2005-07-29T18:11:28+0100 OTMP1 18.510059 ºC
2005-07-29T18:11:28+0100 RGC0 3496.000000 tips
2005-07-29T18:11:28+0100 RGC1 3460.000000 tips
```

If the file name begins with a pipe symbol (|), then it is taken as the name of an application that accepts the data on standard input. This might be used to update the database with derived (calculated) values, or drive an additional display device (see `pert-log.rb`, which drives a Pertelian LCD display via the pertd2 program).

```
log = w1pgsql=dbname=w1retap user=postgres
log = w1file=|/usr/local/bin/pert-log.rb
```

The file wetbulb-snow.rb shows how a piped script can be used to update the database with derived values from the current set of readings (wet bulb temperature and snow height).
Finally, **it should be noted that piped scripts are run synchronously by the w1retap application**. This means that the scripts (in total) should not take longer to execute that the w1retap cycle period, and **care must be taken to ensure that the scripts cannot hang or block** for indefinite periods, as this would cause w1retap also to block and subsequent readings would be lost. As an example, the `pert-log.rb` script takes great care to use non-blocking I/O to ensure that any hang writing to the pertd FIFO cannot cause the main w1retap application to hang.
See also the configuration file log_delimiter and log_time_t entries, as these can affect the format of this log.

w1xml

This provides basic file system access for logging only. It writes an XML file to STDOUT or a supplied file name:

```
log = w1xml
log = w1xml=/tmp/w1xml.log
```

The data output is in the format:

```
<?xml version="1.0" encoding="utf-8"?>
<report timestamp="2005-08-01T19:51:45+0100" unixepoch="1122922305">
  <sensor name="GHT" value="17.0625" units="°C"></sensor>
  <sensor name="OHUM" value="96.4636" units="%"></sensor>
```

```
  <sensor name="OTMP0" value="16.2500" units="°C"></sensor>
  <sensor name="OPRS" value="1017.8268" units="hPa"></sensor>
  <sensor name="OTMP1" value="16.9916" units="°C"></sensor>
  <sensor name="RGC0" value="3544.0000" units="tips"></sensor>
  <sensor name="RGC1" value="3508.0000" units="tips"></sensor>
</report>
```

Since w1retap v1.29, w1retap uses libxml2 to write out syntactically correct XML. This also means that (a) there is a dependency on libxml2 and (b) the input, including any values (such as names and units) in the database must be UTF-8. The file name may be prefixed with a pipe symbol to pipe the data to another program (as for w1file).

w1csv

This module provides basic file system access for logging only. It writes an CSV file to STDOUT or a supplied file name:

```
log = w1csv
log = w1csv=/tmp/w1data.csv
```

The data output is in the format of a timestamp followed by abbreviations, values and units (all on one line):

```
"2005-08-01T19:51:45+0100", "GHT", 17.062500, "°C", "OHUM",
96.463608, "%", "OTMP0", 16.250000, "°C", "OPRS",
1017.826843, "hPa", "OTMP1", 16.991602, "°C", "RGC0",
3544.000000, "tips", "RGC1", 3508.000000, "tips"
```

The file name may be prefixed with a pipe symbol to pipe the data to another program (as for w1file).

w1sqlite

This provides database system access for configuration and logging using an Sqlite v.3 <http://www.sqlite.org> RDBMS. If used as a 'init' parameter, it reads the w1sensors table for sensor information as described for RDBMS based sensor configuration. e.g.

```
init = w1sqlite=/var/tmp/sensors.db
```

The name of the database is a mandatory parameter.
If used as a 'log' parameter, it writes data to the readings table.

```
log = w1sqlite=/var/tmp/sensors.db
```

The data is logged as (date, abbreviation, value):

```
$ sqlite3 /var/tmp/sensors.db
SQLite version 3.2.2
Enter ".help" for instructions
sqlite> select * from readings order by date  desc limit 7;
1122735840|GHT|25.625
1122735840|OHUM|87.6851425170898
1122735840|OTMP0|18.34375
1122735840|OPRS|1009.77972412109
1122735840|OTMP1|19.1231441497803
1122735840|RGC0|3498
1122735840|RGC1|3462
```

Where date is the unix epoch time (time_t), seconds since 00:00:00 1 Jan 1970 UTC.

w1pqsql

This provides database system access for configuration and logging using an PostgreSQL <http://www.postgresql.org> RDBMS.

If used as a 'init' parameter, it reads the w1sensors table for sensor information as described for RDBMS based sensor configuration.
e.g.

```
init = w1pgsql=dbname=w1retap user=postgres
```

The name of the database is a mandatory parameter, followed by optional parameters in the format described for PostgreSQL client programs e.g. See http://www.postgresql.org/docs/8.0/interactive/libpq.html section 27.1 describing the 'conninfo' format.
If used as a 'log' parameter, it writes data to the readings table.

```
log = w1pgsql=dbname=w1retap user=postgres
```

The data is logged as (date abbreviation value) [see sqlite example].

w1mysql

This provides database system access for configuration and logging using a MySQL < http://dev.mysql.com/> RDBMS.
If used as a 'init' parameter, it reads the w1sensors table for sensor information as described for RDBMS based sensor configuration.
e.g.

```
init = w1mysql=dbname=w1retap user=w1retap host=kanga
```

The name of the database is a mandatory parameter, followed by optional parameters of:

```
dbname - name of the database
user – username
password - user's password
host - database server
```

If used as a 'log' parameter, it writes data to the readings table.

```
log = w1mysql=dbname=w1retap user=jrh host=kanga
```

The data is logged as (date abbreviation value) [see sqlite example].

w1odbc

This provides database system access for configuration and logging using ODBC <http://www.unixodbc.org/> RDBMS. It may thus be used for any database for which there is no specific **w1retap** module, but you have an ODBC driver.
If used as a 'init' parameter, it reads the w1sensors table for sensor information as described for RDBMS based sensor configuration.
e.g.

```
init = w1odbc=DSN=W1RETAP
```

The DSN of the database is a mandatory parameter.
If used as a 'log' parameter, it writes data to the readings table.

```
log = w1odbc=DSN=W1RETAP
```

The data is logged as (date abbreviation value) [see sqlite example].

w1mongo

This provides document/database system access for configuration and logging using mongodb <http://www.mongodb.org> NOSQL database.
If used as a 'init' parameter, it reads the w1sensors collection for sensor information.
e.g.

```
init = w1mongo=host=heffalump port=27017
```

If used as a 'log' parameter, it writes data to the 'readings' collection.

```
log = w1mongo=replica=wxrep,roo,piglet,kanga/27072
```

The data is logged as a single document for all sensors read at a time:

```
{ "_id" : ObjectId("4ef497eef3d7c63200000521"), "date" :
ISODate("2011-12-23T15:02:00Z"), "CFRAME1" : 10.6875,
"RGC1" : 16219, "RGC0" : 22498, "OHUM" : 95.93062591552734,
"OTMP0" : 10.375, "SOLAR" : 0.24410000443458557, "STMP1" :
9.6875, "OPRS" : 1010.9940185546875, "GHT" : 10.9375,
"OTMP2" : 11.5, "OTMP1" : 19.3125 }
```

The database definition for mongodb may be a standalone host (as the 'init' example above), or a replica set (the 'log' example). The replica set definition consists of a comma separated list of the replication set name, followed by host/port pairs (the separator is /), with the port defaulting to the standard 27017.

Running w1retap

w1retap is started from the command line (shell script, @reboot cron job etc). Assuming the permissions of the device (usb/serial) allow non-privileged access, it requires no special privileges and may be run from a normal user account.

If you are using a USB adaptor, it may be necessary to ensure that your user can access (has read and write access) to the USB device. Please see the README.usb text file in the documentation directory. On older Linux, you may need to blacklist the kernel w1 modules (ds{2,9}490, wire).

It accepts the following command options:

```
$ w1retap --help
Usage:
  w1retap [OPTION...] - w1retap

Help Options:
  -h, --help                  Show help options

Application Options:
  -w, --wait                  At startup, wait until next interval
  -1, --once-only             Read once and exit
  -R, --release-interface     Release the 1Wire interface between reads
  -d, --daemonise             Daemonise (background) application
  -T, --no-tmp-log            Disables /tmp/.w1retap.dat logging
  -l, --tmp-log-name=FILE     Names logging file (/tmp/.w1retap.dat)
  -i, --interface=DEVICE      Interface device
  -t, --cycle-time=SECS       Time (secs) between device readings
  -N, --dont-read             Don't read sensors (for debugging)
  -v, --verbose               Verbose messages
  -o, --vane-offset=VAL       Value for N for weather vane (0-15)
  -V, --version               Display version number (and exit)
  -s, --simulate              Simulate readings (for testing, not yet
implemented)
  -u, --use-utc               Store dates as UTC (vice localtime)
  -r, --report-log=FILE       Report log file
```

The author runs **w1retap** as:

```
$ w1retap -d -t 120 -w
```

$ w1retap -Nv will dump out the configuration,

e.g: with `~/.config/w1retap/rc`:

```
#Init file
init = w1pgsql=dbname=sensors user=w1retap
log = w1pgsql=dbname=sensors user=w1retap
rep = w1pgsql=dbname=sensors user=w1retap
altitude = 19
# End of file
```

result:

```
$ ./w1retap -Nv
w1retap v0.0.20-rc1 (c) 2005,2006 Jonathan Hudson
Sensors:
286DA467000000AD DS1820
       1: GHT Greenhouse Temperature °C, 2.5000 /min
10A942C10008009B DS1820
       1: OTMP0 Outside Temperatue °C, 2.5000 /min
1093AEC100080042 DS1820
       1: XTMP2 Garage Temperature °C
26378851000000AB TAI8540
       1: OHUM Humidity %, 7.0000 /min, min=0.00, max=100.04
       1: OTMP2 Garage Temperature °C, 2.5000 /min, min=-10.00, max=50.00
12FC6B34000000A9 TAI8570
       1: OPRS Pressure hPa, 100.0000 /min, min=800.00, max=1200.00
       1: OTMP1 Temperature °C, 2.5000 /min
1D9BB10500000089 TAI8575
       1: RGC0 Counter0  tips, 50.0000 /min
       1: RGC1 Counter1 tips, 50.0000 /min
Plugins:
 0: c [0x8079490] /usr/lib/w1retap/libw1pgsql.so => dbname=sensors user=w1retap
 1: l [0x8079490] /usr/lib/w1retap/libw1pgsql.so => dbname=sensors user=w1retap
 2: r [0x8079490] /usr/lib/w1retap/libw1pgsql.so => dbname=sensors user=w1retap
Normalising pressure for 19m
```

Note that the plugins are assumed to be located in `/usr/lib/w1retap/`, (or where prefix was set at build time, e.g. `–prefix=/usr/local ---> /usr/local/lib/w1retap`) unless the name starts with '/' or '.'; in which case the actual path is used. If you don't give a path, you can name the module without 'lib' and '.so'. The loading mechanism (GLib/gmodule) should work on any platform where dynamically loadable libraries are supported (most Unix, Microsoft Windows etc.), but is only tested on Linux and (occasionally, FreeBSD).

e.g.

```
log = w1csv
log = ./libw1xml.so
log = /tmp/testme-harder/libw1b0rken.so
```

And for Mihail Peltekov's sensors:

```
$ w1retap -Nv
w1retap v0.0.20-rc1 (c) 2005,2006 Jonathan Hudson
Sensors:
106B89C4000800B9 DS18S20
	1: DS1820 Temp Temperature °C
264E1169000000B5 MPX4115A
	Microlan: 1FCD2D020000007F, main
	Parameters: 34.249672 762.374682
	1: Baro Press Pressure hPa
	2: Baro Temp Temperature °C
01F8A3880E0000A2 SHT11
	Microlan: 1FCD2D020000007F, aux
	1: SHT11 RH Humidity %
	2: SHT11 Temp Temperature °C
1FCD2D020000007F Coupler
	1: MAIN 264E1169000000B5
	2: AUX 01F8A3880E0000A2
Plugins:
 0: c [0x8076130] /home/w1user/lib/w1retap/libw1mysql.so => dbname=sensors
user=w1user password= SomethingSecretAndBulgarian
 1: l [0x8076130] /home/w1user/lib/w1retap/libw1mysql.so => dbname=sensors
user=w1user password=SomethingSecretAndBulgarian
Normalising pressure for 440m
```

Rate Limiting

Very occasionally one of the author's sensors will give a wildly inaccurate reading. In order to prevent these from polluting the database, a concept of rating limiting is implemented. This requires a table 'ratelimit' exists, and contains the sensor abbreviation and the maximum acceptable rate in 'units/minute',min and max values. The following SQL commands created the author's ratelimit table.

```
CREATE TABLE ratelimit ( name text, value real, rmin real, rmax real );
INSERT INTO ratelimit (name, value, rmin, rmax) VALUES ('GHT', 2.5, NULL, NULL);
INSERT INTO ratelimit (name, value, rmin, rmax) VALUES ('OTMP0', 2.5, NULL, NULL);
INSERT INTO ratelimit (name, value, rmin, rmax) VALUES ('OTMP1', 2.5, NULL, NULL);
INSERT INTO ratelimit (name, value, rmin, rmax) VALUES ('OPRS', 100, 800, 1200);
INSERT INTO ratelimit (name, value, rmin, rmax) VALUES ('RGC0', 50, NULL, NULL);
INSERT INTO ratelimit (name, value, rmin, rmax) VALUES ('RGC1', 50, NULL, NULL);
INSERT INTO ratelimit (name, value, rmin, rmax) VALUES ('OTMP2', 2.5, -10, 50);
INSERT INTO ratelimit (name, value, rmin, rmax) VALUES ('OHUM', 7, 0, 100.04);
```

The values are such that they would not normally be seen, but are less than the obviously bizarre rogue value seen very rarely.

Per-sensor polling frequency

By default, **w1retap** polls all the sensors at the same frequency, by default 120 seconds, or the delay value from the configuration file or the -t command line argument. From version 1.27 onwards, a per-sensor value may be applied, by creating a column in the w1sensors table called 'interval'.

```
alter table w1sensors add column interval integer; -- postgres, sqlite3

alter table w1sensors add column `interval` int; -- mysql
```

This column should contain the polling interval for that sensor in seconds, where a

value other than the default is required.

```
update w1sensors set interval=10 where device='286DA467000000AD';
```

A few arbitrary rules apply to this, largely to simplify the implementation:

- The minimum interval is 10 seconds (the 'wake up' time);
- The maximum interval is the delay / -t SECS parameter (default 120s) -- the 'cycle' time;
- If the column is omitted, or the value is NULL or zero, then the default delay value is used;
- If the /tmp log file is used, it is only written when all sensors are read (the 'cycle' value);
- **w1retap** will calculate its wake up value and cycle value, using the highest common factor and lowest common multiple of the individual polling intervals. So if sensors had polling intervals of 10,20,30,40 and 60 seconds, the wake up value would be 10s and the cycle value would be 120s;
- The algorithms may not be robust in the face of “unreasonable” (by my definition) values, but should work for the majority of reasonable cases.

Summary of configuration

Whilst the configuration may seem, at first reading, to be complex or confusing, it is a number of simple and logical steps:

1. Decide on where you want to store the sensor definition and logged data, a relational database is recommended;
2. Create ~/.config/w1retap/rc (or /etc/defaults/w1retap) defining the sensors (init=xxxx), and data logging (log=xxxx) configuration;
3. Create any necessary RDBMS tables, using the supplied scripts as a template;
4. Populate the init=xxxx definitions, using w1find, maybe in conjunction with w1sensors.rb;
5. If you are using the USB one wire device, please see the USB configurations in the documentation directory. It will be necessary to install a udev rule to manage access to the USB device and add the user to the w1retap group, unless you run w1retap as root, which is neither necessary nor recommended.

w1retap dependencies

w1retap has a few dependencies on other libraries in order to build the software, in particular glib-2.0, libxml2 and libusb. If you're using Ubuntu or a similar Debian-derived system, then the following will get you started:

```
# apt-get install build-essential libglib2.0-dev libusb-dev libc-dev
```

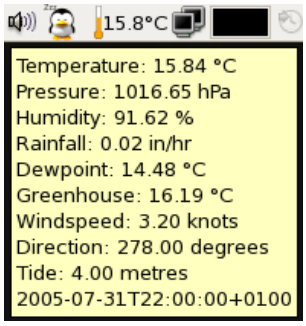
In addition, you will need the development packages for any database you require, e.g. libsqlite3-dev, and libxml2-dev for the “authentic” w1xml logger. In order to minimise dependencies on low powered systems, a specific “--without-libxml” option exists in order to avoid pulling in a heavy dependency.

Viewing the data.

The `wplot.rb` (and other) scripts in the `contrib` directory illustrates techniques to access the data and:

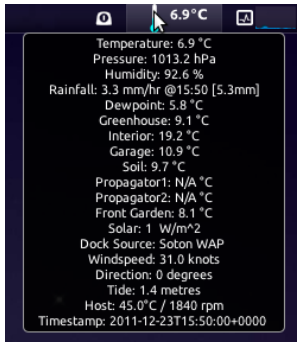
- Build a web page e.g. <http://www.daria.co.uk/wx/>;

- Send data to Wunderground.com (e.g. See <http://www.wunderground.com/global/stations/03865.html >);
- Provide an RSS feed (e.g. <http://www.zen35309.zen.co.uk/wx/wx.rss2.xml>);
- Provide a static XML document of current conditions, (e.g. <http://www.zen35309.zen.co.uk/wx/wx_static.{dat,json}>). The latter format is read by the **w1retap** GNOME applet (`contrib/applet/*`) --- you can provide your own location as I'm sure you don't want to know what it's like here in Netley Marsh.



The `wplot.{pl,rb}` and other scripts also require that the station table is populated. See `contrib/README` for details.

The `contrib/applet/*` directories contain a GNOME applet that can display a single temperature in the GNOME panel, and a set of data defined by the static XML file in a tooltip. Variants are available for Gnome 2 and Gnome 3.



Credits

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Mihail Peltekov <http://zlatograd.com> for providing ssh access to zlatograd.com, which allowed me to develop the DS2480, DS2409, SHT11 and MPX4115A device support;

William R Sowerbutts <http://sowerbutts.com> provided a patch to allow field order independent PgSQL logging, the TAI8515 code and the 'one table per sensor' PgSQL logging code, and other patches, including robust DS2409 handling.

Hans Fong <http://neo.dyn-o-saur.com> kindy donated a Hobby Boards solar sensor.

Leland Helgerson kindly donated a pair of DS1921 ibutton sensors.

Peter Parsons contributed the basis of the MS-TC code.

Andrew Ford lent me a LinkUSB adaptor, which worked out of the box for me (Andrew was not so fortunate, but this is likely a host hardware problem).

Dave Johns lent me a Hobby Boards UV sensor for the development of that interface.

Other users (see Changelog) have provided bug reports, requests for new sensors and other inspiration.

Daria Hudson started this by requiring a temperature sensor in her greenhouse and has graciously allowed me pursue my interest in 1-wire weather stations since then. She also allows me to (ab)use her vanity domain.

Author / contact

w1retap is (c) Jonathan Hudson <jh+w1retap@daria.co.uk>. It is released (mainly) under the GNU Public licence.