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).

The initial release supports any number of the following sensors from AAG Electrónica (AAG) based on Dallas Semiconductors devices:

- TAI8520 (DS1820 / DS18S20) Temperature sensors;
- TAI8540B (DS2438) Humidity Sensor;
- TAI8570 Pressure Sensor;
- TAI8575 Rain Gauge.

I do not own a TAI8515 Weather Station / Anemometer, so this is not supported, but as this device is supported by the Dallas libusblinux300 SDK, upon which **W1RETAP** is based, then adding support should be easy.

W1RETAP is highly 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;
- 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 a DS2490 USB adaptor. As the software is based on the Dallas Semi/Maxim public domain 1-wire USB SDK, adapting for other interfaces (e.g.serial) should be trivial. Likewise, porting to any other operating system that supports the Dallas SDK, the gcc compiler and dynamically loadable modules should also be possible.

The Dallas public domain 1-wire SDK is included in its entirety, and may be build from `makefile.orig`. This will build all the Dallas sample applications, including `tstfind`

which detects devices on the 1-wire network, and other programs that may be useful for troubleshooting.

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.

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 applet.

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`
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, and you can always use `libw1file.so`, as this can 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
```

Create configuration of the database (if used)

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 set of configuration files in their home directory under `.config/w1retap`.

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

The `~/.config/w1retap` directory must contain the file `rc` which configures the application, and optionally `applet` which configures the GNOME applet (see `contrib/w1temp` for details) and `sensors` which defines the 1-wire sensors (unless the sensors are defined in a RDBMS).

Creating the database

If you're using an RDBMS for logging (recommended), create the RDBMS from the `sensors.sql` file.

e.g.

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

or

```
$ psql -U USERNAME template1
template1=# create database w1retap;
CREATE DATABASE
```

```
template1=# \c w1retap;
You are now connected to database "w1retap".
w1retap=# \i sensors.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 sensors.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
```

Configuration of sensors

The initial release supports any number of the following sensors from AAG Electrónica (AAG) based on Dallas Semiconductors devices.

- TAI8520 (DS1820 / DS18S20) Temperature sensors;
- TAI8540B (DS2438) Humidity Sensor;
- TAI8570 Pressure Sensor;
- TAI8575 Rain Gauge.

Unlike some advanced 1-wire applications, your sensors are not 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
);
```

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 `tstfind` program in the `src/libusblinux300` directory to detect the devices.

Type A generic description of the sensor type. This defines how **W1RETAP** will access the device. One of:

- Temperature
- Humidity
- Pressure
- RainGauge

Name A 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.

It is 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 that the device records in. The presence of the abbreviation field determines if that specific function is logged.

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 `tstfind` program.

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');
```

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

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

For my complete station:

```
INSERT INTO "w1sensors" VALUES('286DA467000000AD', 'Temperature', 'GHT',
```

```
'Greenhouse Temperature', '°C', NULL, NULL, NULL);

INSERT INTO "w1sensors" VALUES('2692354D00000095', 'Humidity', 'OHUM',
'Humidity', '%', 'OTMP0', 'Temperature', '°C');

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

INSERT INTO "w1sensors" VALUES('1D9BB10500000089', 'RainGauge', 'RGC0',
'Counter0', 'tips', 'RGC1', 'Counter1', 'tips');
```

or (lines starting # are comments)

```
$ 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).

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 line (e.g. #...) 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 = w1file
#log = w1csv=/tmp/csvlog.txt
#log = w1pgsql=dbname=w1retap user=postgres
#log = w1mysql=dbname=w1retap user=jrh host=kanga password=sososecret
```

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 section 8).

device The name of the interface device. For Linux, using the standard USB interface, this defaults to "DS2490-1".

delay The delay between successive reading of the the 1-wire bus. All sensors are read in one hit.

daemonise If set to 1, **W1RETAP** detaches and runs in the background.

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”.

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):

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

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>
```

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"
```

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].

Running w1retap

W1RETAP is started from the command line (shell script, @reboot cron job etc). Assuming the permissions of usb access allow, it requires no special privileges and may be run from a normal user account.

It accepts the following command options:

```
$ w1retap [-T] [-d] [-i interface] [-N] [-v] [-t sec] [-w] [-r repfile]

where:

-T disables /tmp/.w1retap.dat logging (e.g. logtemp = 0)

-d  causes w1retap to daemonise (run in backgound) (e.g. daemonise = 1)

-i interface specified the interface device. Defaults to

-i DS2490-1, (e.g. interface = DS2490-1)

-N Do not open the device or read the sensors (for debugging).

-v verbose (display configuration information).

-t secs Specify delay loop so -t 120 reads the sensors every 120s [2 minutes] (e.g. Delay = 120)

-w Wait at after startup to the next “Delay” time before reading the sensors (vice immediately).

-r repfile Report to file “repfile” when a sensor is out reports out of range data (see “Rate Limiting” below.
```

Equivalent configuration options are show as (e.g. .....).

The author runs **W1RETAP** as:

```
$ w1retap -d -t 120 -w -r /tmp/w1.limits
```

$ w1retap -Nv will dump out the configuration,

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

```
#Init file
init =  w1sqlite=/var/tmp/sensors.db
#init =  w1file
#init =  w1odbc=DSN=w1retap
#init = w1pgsql=dbname=w1retap user=postgres
log =  w1sqlite=/var/tmp/sensors.db
log =  w1xml=/tmp/w1xmls.log
log =  w1file
log =  w1csv
log = w1pgsql=dbname=w1retap user=w1retap
log = w1mysql=dbname=w1retap user=w1retap host=tigger password=sososecret
# End of file
```

$ ./w1retap -Nv

```
w1retap v0.01 (c) 2005 Jonathan Hudson
Sensors:
286DA467000000AD Temperature
      1: GHT Greenhouse Temperature °C
2692354D00000095 Humidity
      1: OHUM Humidity %
      1: OTMP0 Temperature °C
12FC6B34000000A9 Pressure
      1: OPRS Pressure hPa
      1: OTMP1 Temperature °C
1D9BB10500000089 RainGauge
      1: RGC0 Counter0 tips
      1: RGC1 Counter1 tips
Plugins:
 0: c [0x80793b8] /usr/lib/w1retap/libw1sqlite.so => /var/tmp/sensors.db
 1: l [0x80793b8] /usr/lib/w1retap/libw1sqlite.so => /var/tmp/sensors.db
 2: l [0x8079f38] /usr/lib/w1retap/libw1xml.so => /tmp/w1xmls.log
 3: l [0x807a238] /usr/lib/w1retap/libw1file.so =>
 4: l [0x807a5a0] /usr/lib/w1retap/libw1csv.so =>
 5: l [0x807a960] /usr/lib/w1retap/libw1pgsql.so => dbname=w1retap user=w1retap
 6: l [0x807c0c0] /usr/lib/w1retap/libw1mysql.so => dbname=w1retap user=w1retap
host=tigger password=sososecret
```

Note that the plugins are assumed to be located in `/usr/local/lib/w1retap/`, (or where prefix was set at build time, e.g. `–prefix=/usr ---> /usr/lib/w1retap` [as in the above example]) 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.

e.g.

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

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'. The following SQL commands created the authors ratelimit table.

```
create table ratelimit (name text, value real );
insert into ratelimit values('GHT', 2.5);
insert into ratelimit values('OTMP0', 2.5);
insert into ratelimit values('OTMP1', 2.5);
insert into ratelimit values('OHUM', 15);
insert into ratelimit values('OPRS', 100);
insert into ratelimit values('RGC0', 50);
insert into ratelimit values('RGC1', 50);
```

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

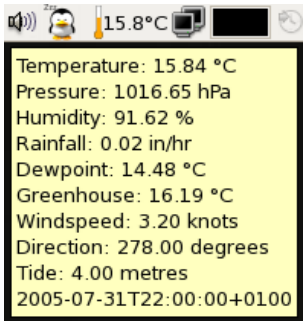
Viewing the data.

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.xml>). The latter format is read by the **W1RETAP** GNOME applet (`contrib/w1temp`) --- 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` and other scripts also require that the station table is populated. See `contrib/README` for details.

The `contrib/w1temp` directory contains 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.



Author / contact

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