pyrtlsdr Documentation

Release 0.2.92

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ONE

OVERVIEW

1.1 pyrtlsdr

A Python wrapper for librtlsdr (a driver for Realtek RTL2832U based SDR's)

1.2 Description

pyrtlsdr is a simple Python interface to devices supported by the RTL-SDR project, which turns certain USB DVB-T dongles employing the Realtek RTL2832U chipset into low-cost, general purpose software-defined radio receivers. It wraps many of the functions in the librtlsdr library including asynchronous read support and also provides a more Pythonic API.

1.3 Links

- Documentation:
  - https://pyrtlsdr.readthedocs.io/
- Releases:
  - https://pypi.org/project/pyrtlsdr/
- Source code and project home:
  - https://github.com/roger-/pyrtlsdr
- Releases for `librtlsdr`:
  - https://github.com/librtlsdr/librtlsdr/releases

1.4 Usage

pyrtlsdr can be installed by downloading the source files and running `python setup.py install`, or using pip and `pip install pyrtlsdr`.

All functions in librtlsdr are accessible via librtlsdr.py and a Pythonic interface is available in rtlsdr.py (recommended). Some documentation can be found in docstrings in the latter file.

1.4.1 Examples

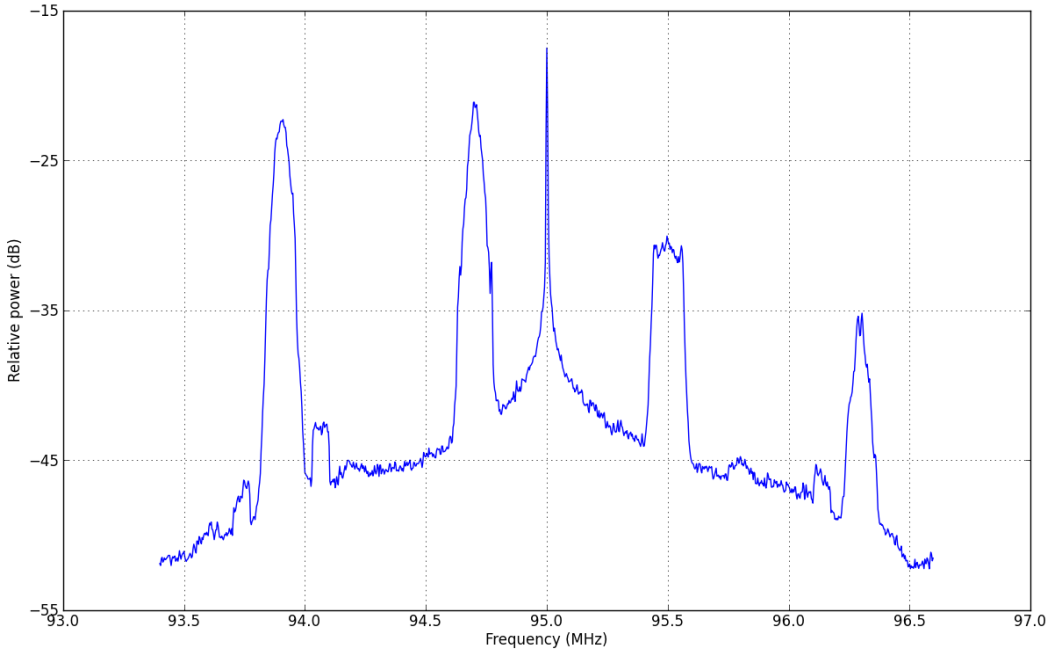
Simple way to read and print some samples:

```
from rtlsdr import RtlSdr

sdr = RtlSdr()

# configure device
sdr.sample_rate = 2.048e6  # Hz
sdr.center_freq = 70e6     # Hz
sdr.freq_correction = 60   # PPM
sdr.gain = 'auto'

print(sdr.read_samples(512))
```

Plotting the PSD with matplotlib:

```
from pylab import *
from rtlsdr import *

sdr = RtlSdr()

# configure device
sdr.sample_rate = 2.4e6
sdr.center_freq = 95e6
sdr.gain = 4

samples = sdr.read_samples(256*1024)
sdr.close()

# use matplotlib to estimate and plot the PSD
psd(samples, NFFT=1024, Fs=sdr.sample_rate/1e6, Fc=sdr.center_freq/1e6)
xlabel('Frequency (MHz)')
ylabel('Relative power (dB)')

show()
```

Resulting Plot:



See the files 'demo_waterfall.py' and 'test.py' for more examples.

1.4.2 Handling multiple devices:

(added in v2.5.6)

```
from rtlsdr import RtlSdr

# Get a list of detected device serial numbers (str)
serial_numbers = RtlSdr.get_device_serial_addresses()

# Find the device index for a given serial number
device_index = RtlSdr.get_device_index_by_serial('00000001')

sdr = RtlSdr(device_index)


# Or pass the serial number directly:
sdr = RtlSdr(serial_number='00000001')
```

Note

Most devices by default have the same serial number: '0000001'. This can be set to a custom value by using the rtl_eeprom utility packaged with `librtlsdr`.

1.5 Experimental features

Two new submodules are available for testing: **rtlsdraio**, which adds native Python 3 asynchronous support (asyncio module), and **rtlsdrtcp** which adds a TCP server/client for accessing a device over the network. See the respective modules in the rtlsdr folder for more details and feel free to test and report any bugs!

1.5.1 rtlsdraio

Note that the rtlsdraio module is automatically imported and adds `stream()` and `stop()` methods to the normal `RtlSdr` class. It also requires the new `async`/`await` syntax introduced in Python 3.5+.

The syntax is basically:

```
import asyncio
from rtlsdr import RtlSdr

async def streaming():
    sdr = RtlSdr()

    async for samples in sdr.stream():
        # do something with samples
        # ...

    # to stop streaming:
    await sdr.stop()

    # done
    sdr.close()

loop = asyncio.get_event_loop()
loop.run_until_complete(streaming())
```

1.5.2 rtlsdrtcp

The `RtlSdrTcpServer` class is meant to be connected physically to an SDR dongle and communicate with an instance of `RtlSdrTcpClient`. The client is intended to function as closely as possible to the base RtlSdr class (as if it had a physical dongle attatched to it).

Both of these classes have the same arguments as the base `RtlSdr` class with the addition of `hostname` and `port`:

```
server = RtlSdrTcpServer(hostname='192.168.1.100', port=12345)
server.run_forever()
# Will listen for clients until Ctrl-C is pressed
```

```
# On another machine (typically)
client = RtlSdrTcpClient(hostname='192.168.1.100', port=12345)
client.center_freq = 2e6
data = client.read_samples()
```

1.5.3 TCP Client Mode

On platforms where the `librtlsdr` library cannot be installed/compiled, it is possible to import the `RtlSdrTcpClient` only by setting the environment variable `"RTLSDR_CLIENT_MODE"` to `"true"`. If this is set, no other modules will be available.

Feature added in v0.2.4

1.6 Dependencies

- Windows/Linux/OSX
- Python 2.7.x/3.3+
- librtlsdr
- **Optional**: NumPy (wraps samples in a more convenient form)

matplotlib is also useful for plotting data. The librtlsdr binaries (rtlsdr.dll in Windows and librtlsdr.so in Linux) should be in the pyrtlsdr directory, or a system path. Note that these binaries may have additional dependencies.

1.7 Todo

There are a few remaining functions in librtlsdr that haven't been wrapped yet. It's a simple process if there's an additional function you need to add support for, and please send a pull request if you'd like to share your changes.

1.8 Troubleshooting

- Some operating systems (Linux, OS X) seem to result in libusb buffer issues when performing small reads. Try reading 1024 (or higher powers of two) samples at a time if you have problems.
- If you're having librtlsdr import errors:
  - **Windows**: Make sure all the librtlsdr DLL files (librtlsdr.dll, libusb-1.0.dll) are in your system path, or the same folder as this README file. Also make sure you have all of *their* dependencies (e.g. libgcc_s_dw2-1.dll or possibly the Visual Studio runtime files). If rtl_sdr.exe works, then you should be okay. Also note that you can't mix the 64 bit version of Python with 32 bit builds of librtlsdr, and vice versa.
  - **Linux**: Make sure your LD_LIBRARY_PATH environment variable contains the directory where the librtlsdr.so.0 library is located. You can do this in a shell with (for example): `export LD_LIBRARY_PATH=$LD_LIBRARY_PATH:/usr/local/lib`. See this issue for more details.

1.9 License

All of the code contained here is licensed by the GNU General Public License v3.

1.10 Credit

Credit to dbasden for his earlier wrapper python-librtlsdr and all the contributers on GitHub.

CHAPTER

TWO

REFERENCE

2.1 rtlsdr.rtlsdr

exception rtlsdr.rtlsdr.**LibUSBError**(*errno*, *msg=''*)

Bases: OSError

class rtlsdr.rtlsdr.**BaseRtlSdr**(*device_index=0*, *test_mode_enabled=False*, *serial_number=None*)

Bases: object

Core interface for most API functionality

Parameters

- **device_index** (int, optional) – The device index to use if there are multiple dongles attached. If only one is being used, the default value (0) will be used.
- **test_mode_enabled** (bool, optional) – If True, enables a special test mode, which will return the value of an internal RTL2832 8-bit counter with calls to *read_bytes()*.
- **serial_number** (str, optional) – If not None, the device will be searched for by the given serial_number by *get_device_index_by_serial()* and the device_index returned will be used automatically.

DEFAULT_GAIN

Default *gain* value used on initialization: 'auto'

DEFAULT_FC

Default *center_freq* value used on initialization: 80e6 (80 Mhz)

Type float

DEFAULT_RS

Default *sample_rate* value used on initialization: 1.024e6 (1024 Msps)

Type float

DEFAULT_READ_SIZE

Default number of samples or bytes to read if no arguments are supplied for *read_bytes()* or *read_samples()*. Default value is 1024

Type int

gain_values

The valid gain parameters supported by the device (in tenths of dB). These are stored as returned by librtlsdr.

Type list(int)

valid_gains_db
The valid gains in dB

Type list(float)

static get_device_index_by_serial(*serial*)
Retrieves the device index for a device matching the given serial number

Parameters **serial** (*str*) – The serial number to search for

Returns The device_index as reported by `librtlsdr`

Return type int

Notes

Most devices by default have the same serial number: *'0000001'*. This can be set to a custom value by using the rtl_eeprom utility packaged with `librtlsdr`.

static get_device_serial_addresses()
Get serial numbers for all attached devices

Returns A `list` of all detected serial numbers (`str`)

Return type list(str)

get_gains()
Get all supported gain values from driver

Returns Gains in tenths of a dB

Return type list(int)

get_tuner_type()
Get the tuner type.

Returns The tuner type as reported by the driver. See the tuner enum definition for more information.

Return type int

init_device_values()
Retrieves information from the device

This method acquires the values for *gain_values*. Also sets the device to the default *center frequency*, the *sample rate* and *gain*

open(*device_index=0*, *test_mode_enabled=False*, *serial_number=None*)
Connect to the device through the underlying wrapper library

Initializes communication with the device and retrieves information from it with a call to *init_device_values()*.

Parameters

- **device_index** (`int`, optional) – The device index to use if there are multiple dongles attached. If only one is being used, the default value (0) will be used.
- **test_mode_enabled** (`bool`, optional) – If True, enables a special test mode, which will return the value of an internal RTL2832 8-bit counter with calls to *read_bytes()*.
- **serial_number** (`str`, optional) – If not None, the device will be searched for by the given serial_number by *get_device_index_by_serial()* and the `device_index` returned will be used automatically.

Notes

The arguments used here are passed directly from object initialization.

Raises **IOError** – If communication with the device could not be established.

packed_bytes_to_iq(*bytes*)
Unpack a sequence of bytes to a sequence of normalized complex numbers

This is called automatically by *read_samples()*.

Returns The unpacked iq values as either a `list` or `numpy.ndarray` (if available).

read_bytes(*num_bytes=1024*)
Read specified number of bytes from tuner.

Does not attempt to unpack complex samples (see *read_samples()*), and data may be unsafe as buffer is reused.

Parameters **num_bytes** (`int`, optional) – The number of bytes to read. Defaults to *DEFAULT_READ_SIZE*.

Returns A buffer of len(num_bytes) containing the raw samples read.

Return type ctypes.Array[c_ubyte]

read_samples(*num_samples=1024*)
Read specified number of complex samples from tuner.

Real and imaginary parts are normalized to be in the range [-1, 1]. Data is safe after this call (will not get overwritten by another one).

Parameters **num_samples** (`int`, optional) – Number of samples to read. Defaults to *DEFAULT_READ_SIZE*.

Returns The samples read as either a `list` or `numpy.ndarray` (if available).

set_agc_mode(*enabled*)
Enable RTL2832 AGC

Parameters **enabled** (*bool*) –

set_direct_sampling(*direct*)
Enable direct sampling.

Parameters **direct** – If False or 0, disable direct sampling. If 'i' or 1, use ADC I input. If 'q' or 2, use ADC Q input.

set_manual_gain_enabled(*enabled*)
Enable or disable manual gain control of tuner.

Parameters **enabled** (*bool*) –

Notes

If `enabled` is False, then AGC should also be used by calling *`set_agc_mode()`*. It is recommended to use `set_gain()` instead of calling this method directly.

property bandwidth
Get/Set bandwidth value (in Hz)

Set value to 0 (default) for automatic bandwidth selection.

Notes

This value is stored locally and may not reflect the real tuner bandwidth

Type int

property center_freq
Get/Set the center frequency of the device (in Hz)

Type int

property fc
Get/Set the center frequency of the device (in Hz)

Type int

property freq_correction
Get/Set frequency offset of the tuner (in PPM)

Type int

property gain
Get/Set gain of the tuner (in dB)

Notes

If set to 'auto', AGC mode is enabled; otherwise gain is in dB. The actual gain used is rounded to the nearest value supported by the device (see the values in *`valid_gains_db`*).

Type float or str

property rs
Get/Set the sample rate of the tuner (in Hz)

Type int

property sample_rate
Get/Set the sample rate of the tuner (in Hz)

Type int

class `rtlsdr.rtlsdr.`**RtlSdr**(*device_index=0*, *test_mode_enabled=False*, *serial_number=None*)
Bases: *`rtlsdr.rtlsdr.BaseRtlSdr`*

This adds async read support to *`BaseRtlSdr`*

_bytes_converter_callback(*raw_buffer*, *num_bytes*, *context*)
Converts the raw buffer used in `rtlsdr_read_async` to a usable type

This method is used internally by *`read_bytes_async()`* to convert the raw data from `rtlsdr_read_async` into a memory-safe array.

The callback given in *`read_bytes_async()`* will then be called with the signature:

```
callback(values, context)
```

Parameters

- **raw_buffer** – Buffer of type `unsigned char`
- **num_bytes** (*int*) – Length of `raw_buffer`
- **context** – User-defined value passed to `rtlsdr_read_async`. In most cases, will be a reference to the *RtlSdr* instance

Notes

This method is not meant to be called directly or overridden by subclasses.

_samples_converter_callback(*buffer*, *context*)

Converts the raw buffer used in `rtlsdr_read_async` to a usable type

This method is used internally by *read_samples_async()* to convert the data into a sequence of complex numbers.

The callback given in *read_samples_async()* will then be called with the signature:

```
callback(samples, context)
```

Parameters

- **buffer** – Buffer of type `unsigned char`
- **context** – User-defined value passed to `rtlsdr_read_async`. In most cases, will be a reference to the *RtlSdr* instance

Notes

This method is not meant to be called directly or overridden by subclasses.

cancel_read_async()

Cancel async read. This should be called eventually when using async reads (*read_bytes_async()* or *read_samples_async()*), or callbacks will never stop.

See also:

limit_time() and *limit_calls()*

read_bytes_async(*callback*, *num_bytes=1024*, *context=None*)

Continuously read bytes from tuner

Parameters

- **callback** – A function or method that will be called with the result. See *_bytes_converter_callback()* for the signature.
- **num_bytes** (*int*) – Number of bytes to read for each callback. Defaults to `DEFAULT_READ_SIZE`.
- **context** (*Optional*) – Object to be passed as an argument to the callback. If not supplied or None, the *RtlSdr* instance will be used.

Notes

As with *read_bytes()*, the data passed to the callback may by overwritten.

read_samples_async(*callback*, *num_samples=1024*, *context=None*)
Continuously read 'samples' from the tuner

This is a combination of `read_samples()` and *read_bytes_async()*

Parameters

- **callback** – A function or method that will be called with the result. See *_samples_converter_callback()* for the signature.
- **num_samples** (*int*) – The number of samples read into each callback. Defaults to `DEFAULT_READ_SIZE`.
- **context** (*Optional*) – Object to be passed as an argument to the callback. If not supplied or None, the *RtlSdr* instance will be used.

2.2 rtlsdr.rtlsdraio

This module adds `asyncio` support for reading samples from the device.

The main functionality can be found in the *stream()* method of *rtlsdr.rtlsdraio.RtlSdrAio*.

Example

```
import asyncio
from rtlsdr import RtlSdr

async def streaming():
    sdr = RtlSdr()

    async for samples in sdr.stream():
        # do something with samples
        # ...

    # to stop streaming:
    await sdr.stop()

    # done
    sdr.close()

loop = asyncio.get_event_loop()
loop.run_until_complete(streaming())
```

class rtlsdr.rtlsdraio.**RtlSdrAio**(*device_index=0*, *test_mode_enabled=False*, *serial_number=None*)
Bases: *rtlsdr.rtlsdr.RtlSdr*

stop()
Stop async stream

Stops the `read_samples_async` and `Excecutor` task created by *stream()*.

stream(*num_samples_or_bytes=131072*, *format='samples'*, *loop=None*)
Start async streaming from SDR and return an async iterator (Python 3.5+).

The `read_samples_async()` method is called in an `Excecutor` instance using `asyncio.AbstractEventLoop.run_in_executor()`.

The returned asynchronous iterable can then used to retrieve sample data using `async for` syntax.

Calling the *`stop()`* method will stop the `read_samples_async` session and close the `Excecutor` task.

Parameters

- **num_samples_or_bytes** (*int*) – The number of bytes/samples that will be returned each iteration
- **format** (`str`, optional) – Specifies whether raw data ("bytes") or IQ samples ("samples") will be returned
- **loop** (*optional*) – An asyncio event loop

Returns An `asynchronous iterator` to yield sample data

class rtlsdr.rtlsdraio.**AsyncCallbackIter**(*func_start*, *func_stop=None*, *queue_size=20*, ***, *loop=None*)

Bases: `object`

Convert a callback-based legacy async function into one supporting asyncio and Python 3.5+

The queued data can be iterated using `async for`

Parameters

- **func_start** – A callable which should take a single callback that will be passed data. Will be run in a seperate thread in case it blocks.
- **func_stop** (*optional*) – A callable to stop `func_start` from calling the callback. Will be run in a seperate thread in case it blocks.
- **queue_size** (`int`, optional) – The maximum amount of data that will be buffered.
- **loop** (*optional*) – The `asyncio.event_loop` to use. If not supplied, `asyncio.get_event_loop()` will be used.

async add_to_queue(**args*)

Add items to the queue

Parameters ***args** – Arguments to be added

This method is a `coroutine`

async start()

Start the execution

The callback given by `func_start` will be called by `asyncio.AbstractEventLoop.run_in_executor()` and will continue until *`stop()`* is called.

This method is a `coroutine`

async stop()

Stop the running executor task

If `func_stop` was supplied, it will be called after the queue has been exhausted.

This method is a `coroutine`

2.3 rtlsdr.rtlsdrtcp

This module allows client/server communication.

The *RtlSdrTcpServer* class is meant to be connected physically to an SDR dongle and communicate with an instance of *RtlSdrTcpClient*.

The client is intended to function as closely as possible to the base *RtlSdr* class (as if it had a physical dongle attatched to it).

Both of these classes have the same arguments as the base *RtlSdr* class with the addition of `hostname` and `port`.

Examples

```
server = RtlSdrTcpServer(hostname='192.168.1.100', port=12345)
server.run_forever()
# Will listen for clients until Ctrl-C is pressed
```

```
# On another machine (typically)
client = RtlSdrTcpClient(hostname='192.168.1.100', port=12345)
client.center_freq = 2e6
data = client.read_samples()
```

Note: On platforms where the `librtlsdr` library cannot be installed/compiled, it is possible to import `RtlSdrTcpClient` only by setting the environment variable `"RTLSDR_CLIENT_MODE"` to `"true"`. If this is set, no other modules will be available.

Feature added in v0.2.4

2.3.1 rtlsdr.rtlsdrtcp.server

class rtlsdr.rtlsdrtcp.server.**RequestHandler**(*request*, *client_address*, *server*)

Bases: socketserver.BaseRequestHandler

close()

finish()

handle(*rx_message=None*)

handle_method_call(*rx_message*)

handle_prop_get(*rx_message*)

handle_prop_set(*rx_message*)

setup()

class rtlsdr.rtlsdrtcp.server.**RtlSdrTcpServer**(*device_index=0*, *test_mode_enabled=False*, *serial_number=None*, *hostname='127.0.0.1'*, *port=None*)

Bases: *rtlsdr.rtlsdr.RtlSdr*, *rtlsdr.rtlsdrtcp.base.RtlSdrTcpBase*

Server that connects to a physical dongle to allow client connections.

close()
Stops the server (if it's running) and closes the connection to the dongle.

open(*device_index=0*, *test_mode_enabled=False*, *serial_number=None*)
Connect to the device through the underlying wrapper library

Initializes communication with the device and retrieves information from it with a call to `init_device_values()`.

Parameters

- **device_index** (`int`, optional) – The device index to use if there are multiple dongles attached. If only one is being used, the default value (0) will be used.
- **test_mode_enabled** (`bool`, optional) – If True, enables a special test mode, which will return the value of an internal RTL2832 8-bit counter with calls to *`read_bytes()`*.
- **serial_number** (`str`, optional) – If not None, the device will be searched for by the given serial_number by `get_device_index_by_serial()` and the `device_index` returned will be used automatically.

Notes

The arguments used here are passed directly from object initialization.

Raises **IOError** – If communication with the device could not be established.

read_bytes(*num_bytes=1024*)
Return a packed string of bytes read along with the struct_fmt.

read_samples(*num_samples=1024*)
This overrides the base implementation so that the raw data is sent. It will be unpacked to I/Q samples on the client side.

run()
Runs the server thread and returns. Use this only if you are running mainline code afterwards. The server must explicitly be stopped by the stop method before exit.

run_forever()
Runs the server and begins a mainloop. The loop will exit with Ctrl-C.

class rtlsdr.rtlsdrtcp.server.**Server**(*rtl_sdr*)
Bases: `socketserver.TCPServer`

server_close()
Called to clean-up the server.

May be overridden.

REQUEST_RECV_SIZE = 1024

class rtlsdr.rtlsdrtcp.server.**ServerThread**(*rtl_sdr*)
Bases: `threading.Thread`

run()
Method representing the thread's activity.

You may override this method in a subclass. The standard run() method invokes the callable object passed to the object's constructor as the target argument, if any, with sequential and keyword arguments taken from the args and kwargs arguments, respectively.

stop()

rtlsdr.rtlsdrtcp.server.**run_server**()
Convenience function to run the server from the command line with options for hostname, port and device index.

2.3.2 rtlsdr.rtlsdrtcp.client

class rtlsdr.rtlsdrtcp.client.**RtlSdrTcpClient**(*device_index=0*, *test_mode_enabled=False*, *hostname='127.0.0.1'*, *port=None*)

Bases: *rtlsdr.rtlsdrtcp.base.RtlSdrTcpBase*

Client object that connects to a remote server.

Exposes most of the methods and descriptors that are available in the RtlSdr class in a transparent manner allowing an interface that is nearly identical to the core API.

close()

get_bandwidth()

get_center_freq()

get_freq_correction()

get_gain()

get_gains()

get_sample_rate()

get_tuner_type()

open(**args*)

read_bytes(*num_bytes=1024*)

read_bytes_async(**args*)

read_samples(*num_samples=1024*)

read_samples_async(**args*)

set_bandwidth(*value*)

set_center_freq(*value*)

set_direct_sampling(*value*)

set_freq_correction(*value*)

set_gain(*value*)

set_sample_rate(*value*)

property bandwidth

property center_freq

property fc

property freq_correction

property gain

property rs

property sample_rate

2.3.3 rtlsdr.rtlsdrtcp.base

exception rtlsdr.rtlsdrtcp.base.**CommunicationError**(*msg*, *source_exc=None*)
Bases: Exception

class rtlsdr.rtlsdrtcp.base.**AckMessage**(***kwargs*)
Bases: *rtlsdr.rtlsdrtcp.base.MessageBase*

Simple message type meant for ACKnolegemnt of message receipt

get_header(***kwargs*)
Builds the header data for the message

The `timestamp` is added to the header if not already present.

Returns

Return type dict

class rtlsdr.rtlsdrtcp.base.**ClientMessage**(***kwargs*)
Bases: *rtlsdr.rtlsdrtcp.base.MessageBase*

get_header(***kwargs*)
Builds the header data for the message

The `timestamp` is added to the header if not already present.

Returns

Return type dict

get_response_class()

send_message(*sock*)
Serializes and sends the message

Parameters **sock** – The `socket` object to write to

class rtlsdr.rtlsdrtcp.base.**MessageBase**(***kwargs*)
Bases: object

Base class for messages sent between clients and servers.

Hanldes serialization/deserialization and communication with socket type objects.

timestamp
Timestamp given from `time.time()`

Type float

header
A `dict` containing message type and payload information

Type dict

data
The payload containing either the request or response data

classmethod from_remote(*sock*)
Reads data from the socket and parses an instance of *MessageBase*

Parameters **sock** – The `socket` object to read from

get_ack_response(*sock*)

get_data(***kwargs*)

get_header(***kwargs*)
Builds the header data for the message

The *timestamp* is added to the header if not already present.

Returns

Return type dict

get_response(*sock*)
Waits for a specific response message

The message class returned from `get_response_class()` is used to parse the message (called from *from_remote()*)

Parameters **sock** – The `socket` object to read from

send_message(*sock*)
Serializes and sends the message

Parameters **sock** – The `socket` object to write to

class rtlsdr.rtlsdrtcp.base.**RtlSdrTcpBase**(*device_index=0*, *test_mode_enabled=False*, *hostname='127.0.0.1'*, *port=None*)
Bases: `object`

Base class for all `rtlsdrtcp` functionality

Parameters

- **device_index** (`int`, optional) –
- **test_mode_enabled** (`bool`, optional) –
- **hostname** (`str`, optional) –
- **port** (`int`, optional) –

packed_bytes_to_iq(*bytes*)
A direct copy of `rtlsdr.BaseRtlSdr.packed_bytes_to_iq()`

DEFAULT_PORT = 1235

class rtlsdr.rtlsdrtcp.base.**ServerMessage**(***kwargs*)
Bases: *rtlsdr.rtlsdrtcp.base.MessageBase*

classmethod from_remote(*sock*)
Reads data for the socket buffer and reconstructs the appropriate message that was sent by the other end.

This method is used by clients to reconstruct ServerMessage objects and if necessary, use multiple read calls to get the entire message (if the message size is greater than the buffer length)

get_data(***kwargs*)

get_header(***kwargs*)
Builds the header data for the message

The `timestamp` is added to the header if not already present.

Returns

Return type dict

get_response_class()

send_message(*sock*)
Sends the message data to clients.

If necessary, uses multiple calls to send to ensure all data has actually been sent through the socket objects's buffer.

2.4 rtlsdr.helpers

rtlsdr.helpers.**limit_calls**(*max_calls*)
Decorator to cancel async reads after the given number of calls.

Parameters **max_calls** (*int*) – Number of calls to wait for before cancelling

Examples

Stop reading after 10 calls:

```
>>> @limit_calls(10)
>>> def read_callback(data, context):
>>>     print('signal mean:', sum(data)/len(data))
>>> sdr = RtlSdr()
>>> sdr.read_samples_async(read_callback)
```

Notes

See notes in *limit_time()*

rtlsdr.helpers.**limit_time**(*max_seconds*)
Decorator to cancel async reads after a specified time period.

Parameters **max_seconds** – Number of seconds to wait before cancelling

Examples

Stop reading after 10 seconds:

```
>>> @limit_time(10)
>>> def read_callback(data, context):
>>>     print('signal mean:', sum(data)/len(data))
>>> sdr = RtlSdr()
>>> sdr.read_samples_async(read_callback)
```

Notes

The context in either `read_bytes_async()` or `read_samples_async()` is relied upon and must use the default value (the `RtlSdr` instance)

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