# pykiso

***Release 0.19.2***

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CHAPTER

ONE

# WHAT'S NEW IN PYKISO?

## 1.1 Version ongoing

## 1.2 Version 0.19.1

### 1.2.1 Enhance uds-aux with a start and stop tester present

Allows to start and stop the tester present sender manually with the methods start_tester_present_sender and stop_tester_present_sender.

See *UDS tester present sender*

### 1.2.2 New serial connector

Added cc_serial for serial communication.

## 1.3 Version 0.19.0

### 1.3.1 Tool for test suites tags analysis

See *Show and export test suite tags*

### 1.3.2 Double Threaded Auxiliary Interface

Implement a brand new interface using two threads, one for the transmission and one for the reception.

Currently adapted modules: - Proxy Auxiliary - CCProxy channel - Communication Auxiliary - DUT Auxiliary - Record Auxiliary - Acroname Auxiliary - Instrument Auxiliary - UDS Auxiliary - UDS server Auxiliary

There is not API changes, therefor, as user, your tests should not be affected.

### 1.3.3 Agnostic CCSocketCan

Incompatibilities with the agnostic proxy are now resolved. You should be able to use it again.

### 1.3.4 Tester Present Sender

Add a context manager, tester present sender, that send cyclic tester present frames to keep UDS session alive more than 5 seconds

See *Using UDS protocol*

### 1.3.5 RTT connector log folder creation

RTT connector now creates a log folder if it does not exist instead of throwing an error.

### 1.3.6 Communication Auxiliary

To save on memory, the communication auxiliary does not collect received messages automatically anymore. The functionality is now available with the context manager `collect_messages`.

See examples/templates/suite_com/test_com.py

The collected messages by the Communication auxiliary can still be cleared with the API method :py:meth`~pykiso.lib.auxiliaries.communication_auxiliary.CommunicationAuxiliary.clear_buffer`

See *communication_auxiliary*

### 1.3.7 DUT Auxiliary adaption

refactor/redesign of the device under test auxiliary to fit with the brand new double threaded auxiliary interface

### 1.3.8 Record Auxiliary adaption

adapt the record auxiliary to fit with the brand new double threaded auxiliary interface

### 1.3.9 Acroname Auxiliary adaption

adapt the acroname auxiliary to fit with the brand new double threaded auxiliary interface

### 1.3.10 Agnostic tag call

Instead of having only the 2 tags “variant” and “branch_level” to select tests, users can now set any tagname.

See: *Define the test information* for more details.

### 1.3.11 Configurable waiting for send_uds_raw

To avoid extra waiting time during long/heavy UDS data exchange(flashing) expose the parameter tpWaitTime from kiso-testing-python-uds for uds auxilary send_uds_raw method

See *Using UDS protocol*

### 1.3.12 Lightweight UDS auxiliary configuration

The add of an .ini file to configured the UDS auxiliary and it variant (server) is no more mandatory, every parameter is now reachable in the .yaml file.

See examples/uds.yaml

In addition, if the tp_layer and uds_layer parameters are not given at yaml level a default configuration is applied.

See *Using UDS protocol*

### 1.3.13 Kiso log levels

To let users decide the level of information they want to see in their logs, new log levels have been defined. When launched normally only the logs in the tests and the errors will be active. The option -v (–verbose) should be used to display the internal logs of the framework.

See *Test verbosity*

## 1.4 Version 0.18.0

### 1.4.1 Remote approach for test

Remove all that is remote specific from BasicTestXXXX. The remote approach is now handle by RemoteTestXXXX.

### 1.4.2 Pykiso To Pytest

See *Pykiso to Pytest*

### 1.4.3 UDS Server Auxiliary

A UDS auxiliary acting as a server/ECU is now implemented. It is based on user-defined callbacks that send a UDS response when the defined request is received.

See *UDS protocol handling as a server*

## 1.5 Version 0.17.0

### 1.5.1 Access Framework's Configuration

All parameters given at CLI and yaml level are available for each test cases/suites. This allows you to access configuration parameters from the CLI and the yaml config. See *Access framework's configuration*

### 1.5.2 "Tag" Are The New "Variant"

The "tag " argument in the pykiso decorator define_test_parameters has been changed to "tag". See *Define the test information*

### 1.5.3 New Python Package Management

Poetry will now be used to manage pykiso. For more details see the official Poetry web site.

## 1.6 Version 0.16.0

### 1.6.1 Global Config

Configuration paramertes can now be passed from the cli or the yaml file into your test.

See *Access framework's configuration*

### 1.6.2 Fail Fast

With the new –fail-fast flag which can be passed through the pykiso cli, tests will be stopped on the first error or failure.

At the same time the behavior of the auxiliary create instance was changed. When the auxiliary instance creation are now failing, they will raise an exception. Combined with the new flag the test execution will be stopped when something go wrong.

### 1.6.3 Include Sub-YAMLs

Frequently used configuration parts can be stored in a separate YAML file.

See *Include sub-YAMLs*

CHAPTER

TWO

# GETTING STARTED

## 2.1 User Guide

### 2.1.1 Requirements

- Python 3.7+
- pip

### 2.1.2 Install

```
pip install pykiso
```

Poetry is more appropriate for developers as it automatically creates virtual environments.

```
git clone https://github.com/eclipse/kiso-testing.git
cd kiso-testing
poetry install
poetry shell
```

### 2.1.3 Usage

Once installed the application is bound to `pykiso`, it can be called with the following arguments:

```
$ pykiso --help
Usage: pykiso [OPTIONS]

  Embedded Integration Test Framework - CLI Entry Point.

  TAG Filters: any additional option to be passed to the test as tag through
  the pykiso call. Multiple values must be separated with a comma.

  For example: pykiso -c your_config.yaml --branch-level dev,master --variant
  delta

Options:
  -c, --test-configuration-file FILE
                                  path to the test configuration file (in YAML
```

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```
                                format)  [required]
  -l, --log-path PATH           path to log-file or folder. If not set will
                                log to STDOUT
  --log-level [DEBUG|INFO|WARNING|ERROR]
                                set the verbosity of the logging
  --junit                       enables the generation of a junit report
  --text                        default, test results are only displayed in
                                the console
  --step-report PATH            generate the step report at the specified
                                path
  --failfast                    stop the test run on the first error or
                                failure
  -v, --verbose                 activate the internal framework logs
  -p, --pattern TEXT            test filter pattern, e.g. 'test_suite_1.py'
                                or 'test_*.py'. Or even more granularly
                                'test_suite_1.py::TestClass::test_name'
  --version                     Show the version and exit.
  -h, --help                    Show this message and exit.
/home/docs/checkouts/readthedocs.org/user_builds/kiso-testing/envs/0.19.2/lib/python3.7/
↪site-packages/pykiso/interfaces/thread_auxiliary.py:41: FutureWarning:␣
↪AuxiliaryInterface will be deprecated in a few releases!
  "AuxiliaryInterface will be deprecated in a few releases!", category=FutureWarning
```

Suitable config files are available in the `examples` folder.

#### Demo using example config

```
pykiso -c ./examples/dummy.yaml --log-level=DEBUG -l killme.log
```

### 2.1.4 Basic configuration

The test configuration files are written in YAML.

Let's use an example to understand the structure.

```yaml
auxiliaries:
  aux1:
    connectors:
        com: chan1
    config: null
    type: pykiso.lib.auxiliaries.dut_auxiliary:DUTAuxiliary
  aux2:
    connectors:
        com:   chan2
    type: pykiso.lib.auxiliaries.dut_auxiliary:DUTAuxiliary
  aux3:
    connectors:
        com:   chan4
        flash: chan3
    type: pykiso.lib.auxiliaries.dut_auxiliary:DUTAuxiliary
```

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```yaml
connectors:
  chan1:
    config: null
    type: ext_lib/cc_example.py:CCExample
  chan2:
    type: ext_lib/cc_example.py:CCExample
  chan4:
    type: ext_lib/cc_example.py:CCExample
  chan3:
    config: null
    type: pykiso.lib.connectors.cc_flasher_example:FlasherExample
test_suite_list:
- suite_dir: test_suite_1
  test_filter_pattern: '*.py'
  test_suite_id: 1
- suite_dir: test_suite_2
  test_filter_pattern: '*.py'
  test_suite_id: 2

requirements:
  - pykiso : '>=0.10.1'
  - robotframework : 3.2.2
  - pyyaml: any
```

### Connectors

The connector definition is a named list (dictionary in python) of key-value pairs, namely config and type.

```yaml
    connectors:
        com:   chan4
        flash: chan3
    type: pykiso.lib.auxiliaries.dut_auxiliary:DUTAuxiliary
connectors:
  chan1:
    config: null
    type: ext_lib/cc_example.py:CCExample
  chan2:
    type: ext_lib/cc_example.py:CCExample
```

The channel alias will identify this configuration for the auxiliaries.

The config can be omitted, *null*, or any number of key-value pairs.

The type consists of a module location and a class name that is expected to be found in the module. The location can be a path to a python file (Win/Linux, relative/absolute) or a python module on the python path (e.h. *pykiso.lib.connectors.cc_uart*).

```yaml
<chan>:                     # channel alias
    config:                 # channel config, optional
        <key>: <value>      # collection of key-value pairs, e.g. "port: 80"
    type: <module:Class>    # location of the python class that represents this channel
```

### Auxiliaries

The auxiliary definition is a named list (dictionary in python) of key-value pairs, namely config, connectors and type.

```
auxiliaries:
  aux1:
    connectors:
        com: chan1
    config: null
    type: pykiso.lib.auxiliaries.dut_auxiliary:DUTAuxiliary
  aux2:
    connectors:
        com:   chan2
    type: pykiso.lib.auxiliaries.dut_auxiliary:DUTAuxiliary
  aux3:
```

The auxiliary alias will identify this configuration for the testcases. When running the tests the testcases can import an auxiliary instance defined here using

```
from pykiso.auxiliaries import <alias>
```

The connectors can be omitted, *null*, or any number of role-connector pairs. The roles are defined in the auxiliary implementation, usual examples are *com* and *flash*. The channel aliases are the ones you defined in the connectors section above.

The config can be omitted, *null*, or any number of key-value pairs.

The type consists of a module location and a class name that is expected to be found in the module. The location can be a path to a python file (Win/Linux, relative/absolute) or a python module on the python path (e.h. *pykiso.lib.auxiliaries.communication_auxiliary*).

```
<aux>:                          # aux alias
    connectors:                 # list of connectors this auxiliary needs
        <role>: <channel-alias>  # <role> has to be the name defined in the Auxiliary␣
↪class,
                                #  <channel-alias> is the alias defined above
    config:                     # channel config, optional
        <key>: <value>          # collection of key-value pairs, e.g. "port: 80"
    type: <module:Class>        # location of the python class that represents this␣
↪auxiliary
```

### Test Suites

The test suite definition is a list of key-value pairs.

```
  chan4:
    type: ext_lib/cc_example.py:CCExample
  chan3:
    config: null
    type: pykiso.lib.connectors.cc_flasher_example:FlasherExample
test_suite_list:
- suite_dir: test_suite_1
  test_filter_pattern: '*.py'
  test_suite_id: 1
```

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```
- suite_dir: test_suite_2
  test_filter_pattern: '*.py'
  test_suite_id: 2
```

Each test suite consists of a *test_suite_id*, a *suite_dir* and a *test_filter_pattern*.

For fast test development, the *test_filter_pattern* can be overwritten from the command line in order to e.g. execute a single test file inside the *suite_dir* using the CLI argument *-p* or *–pattern*:

```
pykiso -c dummy.yaml
```

To learn more, please take a look at *How to make the most of the config file*.

### 2.1.5 Basic test writing

#### Flow

1. Create a root-folder that will contain the tests. Let us call it *test-folder*.
2. Create, based on your test-specs, one folder per test-suite.
3. In each test-suite folder, implement the tests. (See how below)
4. write a configuration file (see *How to make the most of the config file*)
5. If your test-setup is ready, run `pykiso -c <ROOT_TEST_DIR>`
6. If the tests fail, you will see it in the the output. For more details, you can take a look at the log file (logs to STDOUT as default).

---

**Note:** User can run several test using several times flag -c. If a folder path is specified, a log for each yaml file will be stored. If otherwise a filename is provided, all log information will be in one logfile.

---

#### Define the test information

For each test fixture (setup, teardown or test_run), users have to define the test information using the decorator *define_test_parameters*. This decorator gives access to the following parameters:

- `suite_id`: current test suite identification number
- `case_id`: current test case identification number (optional for test suite setup and teardown)
- `aux_list`: list of used auxiliaries

In order to utilise the SetUp/TearDown test-suite feature, users have to define a class inheriting from *BasicTestSuiteSetup* or *BasicTestSuiteTeardown*. For each of these classes, the following methods `test_suite_setUp` or `test_suite_tearDown` must be overridden with the behaviour you want to have.

---

**Note:**

Because the python unittest module is used in the background, all methods
starting with “def **test_**” are executed automatically

**Note:** If a test in SuiteSetup raises an exception, all tests which belong to the same suite_id will be skipped.

Find below a full example for a test suite/case declaration :

```
"""
Add test suite setup fixture, run once at test suite's beginning.
Test Suite Setup Information:
-> suite_id : set to 1
-> case_id : Parameter case_id is not mandatory for setup.
-> aux_list : used aux1 and aux2 is used
"""
  @pykiso.define_test_parameters(suite_id=1, aux_list=[aux1, aux2])
  class SuiteSetup(pykiso.BasicTestSuiteSetup):
      def test_suite_setUp():
          logging.info("I HAVE RUN THE TEST SUITE SETUP!")
          if aux1.not_properly_configured():
              aux1.configure()
          aux2.configure()
          callback_registering()

"""
Add test suite teardown fixture, run once at test suite's end.
Test Suite Teardown Information:
-> suite_id : set to 1
-> case_id : Parameter case_id is not mandatory for setup.
-> aux_list : used aux1 and aux2 is used
"""
  @pykiso.define_test_parameters(suite_id=1, aux_list=[aux1, aux2])
  class SuiteTearDown(pykiso.BasicTestSuiteTeardown):
      def test_suite_tearDown():
          logging.info("I HAVE RUN THE TEST SUITE TEARDOWN!")
          callback_unregistering()

"""
Add a test case 1 from test suite 1 using auxiliary 1.
  Test Suite Teardown Information:
-> suite_id : set to 1
-> case_id : set to 1
-> aux_list : used aux1 and aux2 is used
"""
  @pykiso.define_test_parameters(
          suite_id=1,
          case_id=1,
          aux_list=[aux1, aux2]
  )
  class MyTest(pykiso.BasicTest):
      pass
```

### Implementation of Basic Tests

**Structure**: *test-folder/test-suite-1/***test_suite_1.py**

**test_suite_1.py**:

```
 """
 I want to run the following tests documented in the following test-specs <TEST_CASE_
↪SPECS>.
 """
  import pykiso
  from pykiso.auxiliaries import aux1, aux2

"""
Add test suite setup fixture, run once at test suite's beginning.
Parameter case_id is not mandatory for setup.
"""
  @pykiso.define_test_parameters(suite_id=1, aux_list=[aux1, aux2])
  class SuiteSetup(pykiso.BasicTestSuiteSetup):
      pass

"""
Add test suite teardown fixture, run once at test suite's end.
Parameter case_id is not mandatory for teardown.
"""
  @pykiso.define_test_parameters(suite_id=1, aux_list=[aux1, aux2])
  class SuiteTearDown(pykiso.BasicTestSuiteTeardown):
      pass

"""
Add a test case 1 from test suite 1 using auxiliary 1.
"""
  @pykiso.define_test_parameters(suite_id=1, case_id=1, aux_list=[aux1])
  class MyTest(pykiso.BasicTest):
      pass

"""
Add a test case 2 from test suite 1 using auxiliary 2.
"""
  @pykiso.define_test_parameters(suite_id=1, case_id=2, aux_list=[aux2])
  class MyTest2(pykiso.BasicTest):
      pass
```

### How are the tests called

Let us imagine we have 2 test-cases which are part of a test-suite.

```
import pykiso
from pykiso.auxiliaries import aux1, aux2

@pykiso.define_test_parameters(suite_id=1, aux_list=[aux1, aux2])
class SuiteSetup(pykiso.BasicTestSuiteSetup):
    pass
```

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```
@pykiso.define_test_parameters(suite_id=1, aux_list=[aux1, aux2])
class SuiteTearDown(pykiso.BasicTestSuiteTeardown):
    pass

@pykiso.define_test_parameters(suite_id=1, case_id=1, aux_list=[aux1])
class TestCase1(pykiso.BasicTest):
    def setUp(self):
        pass
    def test_run_1(self):
        pass
    def test_run_2(self):
        pass
    def tearDown(self):
        pass

@pykiso.define_test_parameters(suite_id=1, case_id=1, aux_list=[aux1])
class TestCase2(pykiso.BasicTest):
    def setUp(self):
        pass
    def test_run_1(self):
        pass
    def test_run_2(self):
        pass
    def tearDown(self):
        pass
```

The pykiso will call the elements in the following order:

```
TestSuiteSetup().test_suite_setUp
TestCase1.setUpClass
    TestCase1().setUp
    TestCase1().test_run
    TestCase1().tearDown
    TestCase1().setUp
    TestCase1().test_run_2
    TestCase1().tearDown
TestCase1.tearDownClass
TestCase2.setUpClass
    TestCase2().setUp
    TestCase2().test_run
    TestCase2().tearDown
    TestCase2().setUp
    TestCase2().test_run_2
    TestCase2().tearDown
TestCase2.tearDownClass
TestSuiteTeardown().test_suite_tearDown
```

To learn more, please take a look at *How to make the most of the tests*.

## 2.2 Contribution Guide

### 2.2.1 What should I do before I get started?

You need to go through few steps to get the ball rolling. But no worries, it is pretty straightforward.

### 2.2.2 Accounts

First of all, you need accounts for:

- Github account, some of you might already have one. If not, you can go to github and register a free user account in 2 minutes.

---

**Note:** If you are working for a company and the work you are going to contribute is in the name of the company, please register your account using company email address.

- Eclipse account, since Kiso-testing is an Eclipse project

(full name: Eclipse Kiso-testing), you need an Eclipse account. Go to https://accounts.eclipse.org/user/register to register one for free.

---

After a successful registration, you need to hook up your github account with Eclipse account. Login in Eclipse foundation website and go to 'Edit My Profile' where you can bind your github account information.

### 2.2.3 ECA signing

ECA stands for 'Eclipse Contributor Agreement', which is a prerequisite to become a contributor. No paper work needed, go to https://www.eclipse.org/legal/ECA.php , read it carefully and follow its instruction to sign.

### 2.2.4 DCO signing

DCO stand for "Developer's Certificate of Origin", which you will encounter as part of ECA signing process. It is highly recommended that you read it, while you as a developer might overlook the legal consequences if the way you contribute does not follow certain rules and regulations.

### 2.2.5 License

License is one of the few first things people would think of, when they use or develop an open source project. Eclipse Kiso is and will be developed under the EPL v2.0 license from Eclipse foundation. Of course this exclude 3rd party source code.

EPL v2.0 is available under https://www.eclipse.org/legal/epl-2.0/ . You need read it carefully before using Kiso-testing or developing on Kiso-testing and make sure that you understand your rights and obligations.

Any contributions to Kiso-testing project code base needs to be licensed under EPL v2.0.

### 2.2.6 How to setup my environment?

#### Requirements

- Python 3.7+
- poetry (used to get the rest of the requirements)

#### Install

```
git clone https://github.com/eclipse/kiso-testing.git
cd kiso-testing
poetry install
poetry shell
```

#### Pre-Commit

To improve code-quality, a configuration of pre-commit hooks are available. The following pre-commit hooks are used:

- black
- flake8
- isort
- trailing-whitespace
- end-of-file-fixer
- check-docstring-first
- check-json
- check-added-large-files
- check-yaml
- debug-statements

If you don't have pre-commit installed, you can get it using pip:

```
pip install pre-commit
```

Start using the hooks with

```
pre-commit install
```

#### Demo using example config

```
invoke run
```

#### Running the Tests

```
invoke test
```

or

```
pytest
```

#### Building the Docs

```
invoke docs
```

### 2.2.7 What should I do before committing ?

### 2.2.8 PEP8-Compliancy

In order to maintain clear and user-friendly project, make sure that your changes respect PEP8 standards. PEP8 is a guide that provides Python coding conventions (naming, indentation,...). Official document : https://peps.python.org/pep-0008/

To make sure your changes are PEP8 Compliant, different tools exist to help you here:

- **linter (applicable on IDE) :** show some warning directly on IDE.
- **pre-commit hook :** hook scripts that lint the added code using flake8 and format it using black and isort.

### 2.2.9 Typography

Most of the comments made during PR-Reviewing are about typography/misspelling mistakes. An easy way to avoid these is by running codespell on your written code.

### 2.2.10 Function type hinting

In kiso-testing, every implemented function must have annotations for its parameters and return types (type hints). This results in increased readability and therefore in easier comprehension of the code for any reader.

```
def some_fun(some_dict_param: dict, some_string_param: str) -> list:
```

**Note:** As not every types are available in the builtins, or as it is important to precise inner type you might import some from collections module or typing

```
from typing import List
from collections import namedtuple

def some_fun(
    some_int_list_param: List[int], some_imported_type_param: namedtuple
) -> list:
```

### 2.2.11 Unit Testing

To ensure the correct behaviour of your code, add unit tests for every function you implemented.A convenient and pythonic way to do this is this is given by pytest Code coverage is measured with codecov. It simply checks if the code coverage is not going lower than it was before changes.

### 2.2.12 Examples Adaptation

To ensure proper integration of your changes into the existing features, and demonstrate their usages, adapt the examples of modified module, and run it locally.

### 2.2.13 Update Documentation

Regarding documentation there are four main purposes that have to be fulfilled before committing :

- **Documentation regarding the changes :** Make sure that the documentation allow easy understanding of the new feature(s).This step mainly concern docstring (module, class, and function) as shown below, but you could also have to change .rst documentation if your changes concern general working principle of the ITF (e.g. cli) To ensure proper formatting of the documentation, run `invoke docs` in the poetry environment.

```
"""
name_of_the_module
******************

:module: name_of_the_module
:synopsis: short description of the module.

Extended description of the module's functionnality,
how it works, etc

.. currentmodule:: name_of_the_module
"""
```

```
class ClassName:
"""Short description of class"""
```

```
def fun(param1, param2):
"""Short description of fun.

More extended description of the function
if needed.

:param param1: short description of param1
:param param2: short description of param2
:raise exception1: short description of raised exception

:return: short description of the return parameter
"""
```

**Note:** Make also sure to do the type hinting for exceptions

- **What's new section:** Add your changes into the what's new section, so user can stay updated of the brand new features.
- **Changelog: (automatically updated)** Your commit needs to follow the [conventional commits](https://www.conventionalcommits.org/en/v1.0.0/) pattern. Changelog is updated automatically with the commit message.
- Documentation has to build properly.

CHAPTER

THREE

# PYKISO DESIGN

## 3.1 Introduction

Integration Test Framework (Pykiso) is a framework that can be used for both white-box and black-box testing as well as in the integration and system testing.

## 3.2 Quality Goals

The framework tries to achieve the following quality goals:

| Quality Goal (with prio) | Scenarios |
|---|---|
| **Portability** | The framework shall run on linux, windows, macOS |
| | The framework shall run on a raspberryPI or a regular laptop |
| **Modularity** | The framework shall allow me to implement complex logic and to run it over any communication port |
| | The framework shall allow me to add any communication port |
| | The framework shall allow me to use private modules within my tests if it respects its APIs |
| | The framework shall allow me to define my own test approach |
| **Correctness** | The framework shall verify that its inputs (test-setup) are correct before performing any test |
| | The framework shall execute the provided tests always in the same order |
| **Usability** | The framework shall feel familiar for embedded developers |
| | The framework shall feel familiar for system tester |
| | The framework shall generate test reports that are human and machine readable |
| **Performance** (new) | The framework shall use only the right/reasonable amount of resources to run (real-time timings) |

## 3.3 Design Overview

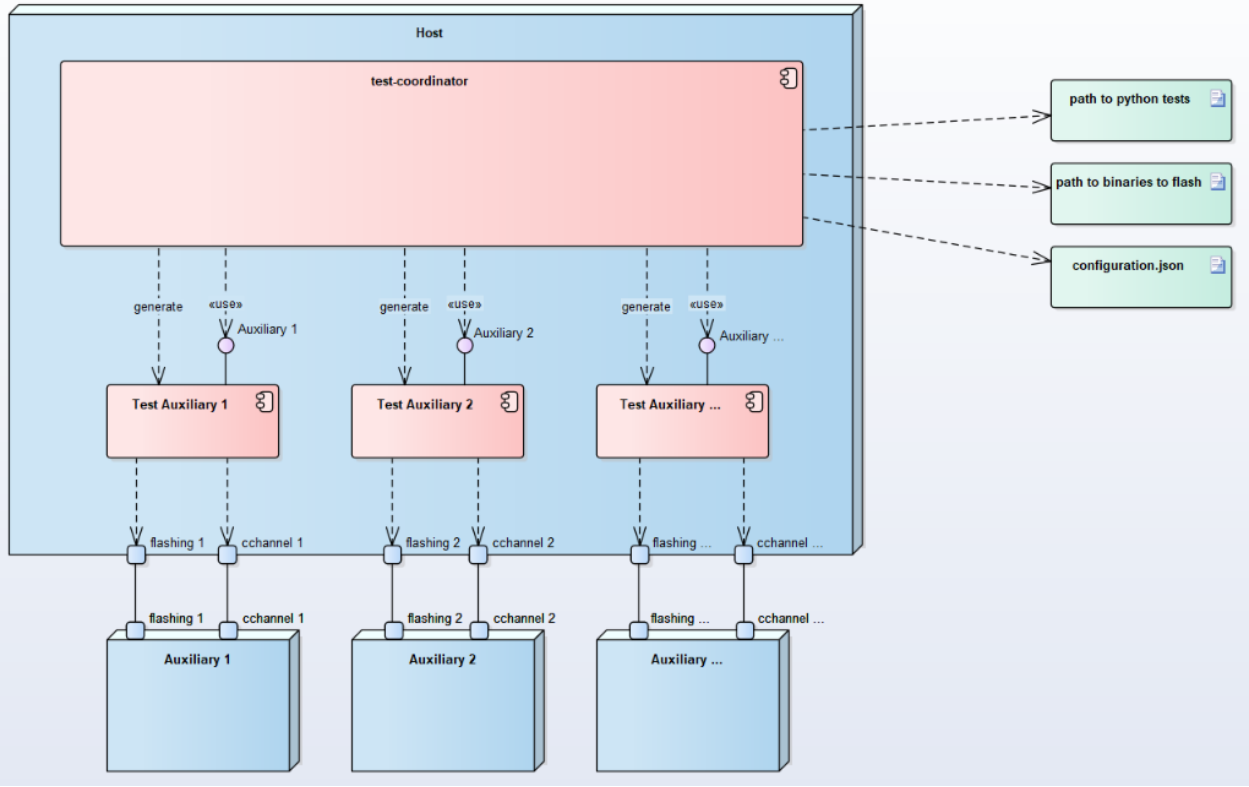


Fig. 1: Figure 1: Integration Test Framework Context

The *pykiso* Testing Framework is built in a modular and configurable way with abstractions both for entities (e.g. a handler for the device under test) and communication (e.g. UART or TCP/IP).

The tests leverage the python *unittest*-Framework which has a similar flavor as many available major unit testing frameworks and thus comes with an ecosystem of tools and utilities.

### 3.3.1 Test Coordinator

The **test-coordinator** is the central module setting up and running the tests. Based on a configuration file (in YAML), it does the following:

- instantiate the selected connectors
- instantiate the selected auxiliaries
- provide the auxiliaries with the matching connectors
- generate the list of tests to perform
- provide the testcases with the auxiliaries they need
- verify if the tests can be performed
- for remote tests (see *Remote Test*) flash and run and synchronize the tests on the auxiliaries
- gather the reports and publish the results

### 3.3.2 Auxiliary

The **auxiliary** provides to the **test-coordinator** an interface to interact with the physical or digital auxiliary target. It is composed by 2 blocks:

- instance creation / deletion
- connectors to facilitate interaction and communication with the device (e.g. messaging with *UART*)

For example auxiliaries like the one interacting with cloud services, we may have:

- A communication channel (**cchannel**) like *REST*

#### Create an Auxiliary

Detailed information can be found here *How to create an auxiliary*.

### 3.3.3 Connector

#### Communication Channel

The Communication Channel - also known as **cchannel** - is the medium to communicate with auxiliary target. Example include *UART*, *UDP*, *USB*, *REST*,... The communication protocol itself can be auxiliary specific.

#### Create a Connector

Detailed information can be found here *How to create a connector*.

### 3.3.4 Dynamic Import Linking

The *pykiso* framework was developed with modularity and reusability in mind. To avoid close coupling between test-cases and auxiliaries as well as between auxiliaries and connectors, the linking between those components is defined in a config file (see *How to make the most of the config file*) and performed by the *TestCoordinator*.

Different instances of connectors and auxiliaries are given *aliases* which identify them within the test session.

Let's say we have this (abridged) config file:

```
connectors:
  my_chan:           # Alias of the connector
    type: ...
auxiliaries:
  my_aux:            # Alias of the auxiliary
    connectors:
        com: my_chan # Reference to the connector
    type: ...
```

The auxiliary *my_aux* will automatically be initialised with *my_chan* as its *com* channel.

When writing your testcases, the auxiliary will then be available under its defined alias.

```
from pykiso.auxiliaries import my_aux
```

The `pykiso.auxiliaries` is a magic package that only exists in the `pykiso` package after the `TestCoordinator` has processed the config file. It will include all *instances* of the defined auxiliares, available at their defined alias.

## 3.4 Usage

Please see *How to make the most of the config file* to have a deep-dive on how the pykiso configuration work.

Please see *How to make the most of the tests* to have a deep-dive on how pykiso tests work.

CHAPTER

FOUR

# ADVANCED USAGE

## 4.1 How to make the most of the config file

### 4.1.1 Requirements specification

[optional] - Any package specified will be checked.

Use cases:

- A new feature is introduced and used in the test
- Breaking change introduced with a new release
- Specific package used in a test that does not belong to pykiso

```
#_____________________________ Requirements section _____________________________
# FEATURE: Check the environment before running the tests
#
# The version can be:
#   - specified alone (minimum version accepted)
#   - conditioned using <, <=, >, >=, == or !=
#   - no specified using 'any' (accept any version)
#
# /!\: If the check fail, the tests will not start and the mismatch
#      displayed
#_________________________________________________________________________________
requirements:
  - pykiso: '>=0.10.1, <1.0.0'
  - robotframework: 3.2.2
  - pyyaml: any
```

### 4.1.2 Real-World Configuration File

```
auxiliaries:
  DUT:
    connectors:
        com: uart
    config: null
    type: pykiso.lib.auxiliaries.example_test_auxiliary:ExampleAuxiliary
connectors:
  uart:
```

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```
    config:
      serialPort: COM3
    type: pykiso.lib.connectors.cc_uart:CCUart
test_suite_list:
- suite_dir: test_suite_1
  test_filter_pattern: '*.py'
  test_suite_id: 1
```

### 4.1.3 Activation of specific loggers

By default, every logger that does not belong to the *pykiso* package or that is not an *auxiliary* logger will see its level set to WARNING even if you have in the command line *pykiso –log-level DEBUG*.

This aims to reduce redundant logs from additional modules during the test execution. For keeping specific loggers to the set log-level, it is possible to set the *activate_log* parameter in the *auxiliary* config. The following example activates the *jlink* logger from the *pylink* package, imported in *cc_rtt_segger.py*:

```
auxiliaries:
  aux1:
    connectors:
      com: rtt_channel
    config:
      activate_log:
      # only specifying pylink will include child loggers
      - pylink.jlink
      - my_pkg
    type: pykiso.lib.auxiliaries.dut_auxiliary:DUTAuxiliary
connectors:
  rtt_channel:
    config: null
    type: pykiso.lib.connectors.cc_rtt_segger:CCRttSegger
```

Based on this example, by specifying *my_pkg*, all child loggers will also be set to the set log-level.

**Note:** If e.g. only the logger *my_pkg.module_1* should be set to the level, it should be entered as such.

### 4.1.4 Ability to use environment variables

It is possible to replace any value by an environment variable in the YAML files. When using environment variables, the following format should be respected: *ENV{my-env-var}*. In the following example, an environment variable called *TEST_SUITE_1* contains the path to the test suite 1 directory.

```
- suite_dir: ENV{TEST_SUITE_1}
  test_filter_pattern: '*.py'
  test_suite_id: 1
- suite_dir: ENV{TEST_SUITE_2=./test_suite_2}
```

It is also possible to set a default value in case the environment variable is not found. The following format should be used: *ENV{my-env-var=my_default_value}*.

In the following example, an environment variable called *TEST_SUITE_2* would contain the path to the test_suite_2 directory. If the variable is not set, the default value will be taken instead.

```
    config: null
```

### 4.1.5 Specify files and folders

To specify files and folders you can use absolute or relative paths. Relative paths are always given **relative to the location of the yaml file**.

According to the YAML specification, values enclosed in single quotes are enforced as strings, and **will not be parsed**.

```
example_config:
    # this relative path will not be made absolute
    rel_script_path_unresolved: './script_folder/my_awesome_script.py'
    # this one will
    rel_script_path: ./script_folder/my_awesome_script.py
    abs_script_path_win: C:/script_folder/my_awesome_script.py
    abs_script_path_unix: /home/usr/script_folder/my_awesome_script.py
```

**Warning:** Relative path or file locations must always start with *./*. If not, it will still be resolved but unexpected behaviour can result from it.

### 4.1.6 Include sub-YAMLs

Frequently used configuration parts can be stored in a separate YAML file. To include this configuration file in the main one, the path to the sub-configuration file has to be provided, preceded with the *!include* tag.

Relative paths in the sub-YAML file are then resolved **relative to the sub-YAML's location**.

```
#_____________________________ Connectors section _____________________________
# FEATURE : yaml in yaml
#
# In order to call a yaml file inside a other yaml file, the special
# tag !include has to be used. The path could be in a relative or
# absolute form.
#_____________________________________________________________________________
connectors:
  <chan>: !include ./channel_config/my_channel_config.yaml
```

### 4.1.7 Make a proxy auxiliary trace

Proxy auxiliary is capable of creating a trace file, where all received messages at connector level are written. This feature is useful when proxy auxiliary is associated with a connector who doesn't have any trace capability (in contrast to cc_pcan_can or cc_rtt_segger for example).

Everything is handled at configuration level and especially at yaml file :

```
proxy_aux:
  connectors:
    # communication channel alias
    com: <channel-alias>
  config:
    # Auxiliaries alias list bound to proxy auxiliary
    aux_list : [<aux alias 1>, <aux alias 2>, <aux alias 3>]
    # activate trace at proxy level, sniff everything received at
    # connector level and write it in .log file.
    activate_trace : True
    # by default the trace is placed where pykiso is launched
    # otherwise user should specify his own path
    # (absolute and relative)
    trace_dir: ./suite_proxy
    # by default the trace file's name is :
    # YY-MM-DD_hh-mm-ss_proxy_logging.log
    # otherwise user should specify his own name
    trace_name: can_trace
  type: pykiso.lib.auxiliaries.proxy_auxiliary:ProxyAuxiliary
```

### 4.1.8 Delay an auxiliary start-up

All threaded auxiliaries are capable to delay their start-up (not starting at import level). This means, from user point of view, it's possible to start it on demand and especially where it's really needed.

> **Warning:** in a proxy set-up be sure to always start the proxy auxiliary last otherwise an error will occurred due to proxy auxiliary specific import rules

In order to achieved that, a parameter was added at the auxiliary configuration level.

```
auxiliaries:
  proxy_aux:
    connectors:
        com: can_channel
    config:
      aux_list : [aux1, aux2]
      activate_trace : True
      trace_dir: ./suite_proxy
      trace_name: can_trace
      # if False create the auxiliary instance but don't start it, an
      # additional call of start method has to be performed.
      # By default, auto_start flag is set to True and "normal" ITF aux
      # creation mechanism is used.
      auto_start: False
    type: pykiso.lib.auxiliaries.proxy_auxiliary:ProxyAuxiliary
  aux1:
    connectors:
        com: proxy_com1
    config:
      auto_start: False
```

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```
    type: pykiso.lib.auxiliaries.communication_auxiliary:CommunicationAuxiliary
  aux2:
    connectors:
        com: proxy_com2
    config:
      auto_start: False
    type: pykiso.lib.auxiliaries.communication_auxiliary:CommunicationAuxiliary
```

In user's script simply call the related auxilairy start method:

```
    used for sending and the other one for the reception
    """

    def setUp(self):
        """If a fixture is not use just override it like below."""
        logging.info(
            f"--------------- SETUP: {self.test_suite_id}, {self.test_case_id} ----------
↪-----"
```

## 4.2 How to make the most of the tests

### 4.2.1 Define the test information (in addition)

In order to link the architecture requirement to the test, an additional reference can be added into the test_run decorator:

- `test_ids`: optional requirements linked to the test that need to be defined as follow:

```
{"Component1": ["Req1", "Req2"], "Component2": ["Req3"]}
```

In order to run only a subset of tests, an additional reference can be added to the test_run decorator:

- tag : [optional] the variant can be defined like:

```
{"variant": ["variant2", "variant1"], "branch_level": ["daily", "nightly"]}
```

Both parameters (variant/branch_level), will play the role of filter to fine tune the test collection and at the end ensure the execution of very specific tests subset.

---

**Note:** cli tags must be given in pairs. If one key has multiple values seperate them with a comma

---

```
pykiso -c configuration_file --variant var1,var2 --branch-level daily,nightly
```

Table 1: Exectuion table for test case tags and cli tag arguments

| test case tags | cli tags | executed |
|---|---|---|
| “branch_level”: [“daily”,”nightly”] | branch_level nightly | |
| “branch_level”: [“daily”,”nightly”] | branch_level nightly,daily | |
| “branch_level”: [“daily”,”nightly”] | branch_level master | |
| “branch_level”: [“daily”,”nightly”],”variant”:[“var1”] | branch_level nightly | |
| “branch_level”: [“daily”,”nightly”],”variant”:[“var1”] | variant var1 | |
| “branch_level”: [“daily”,”nightly”],”variant”:[“var1”] | variant var2 | |
| “branch_level”: [“daily”,”nightly”],”variant”:[“var1”] | branch_level daily variant var1 | |

Find below a full example for a test suite/case declaration :

```
"""
Add test suite setup fixture, run once at test suite's beginning.
Test Suite Setup Information:
-> suite_id : set to 1
-> case_id : Parameter case_id is not mandatory for setup.
-> aux_list : used aux1 and aux2 is used
"""
  @pykiso.define_test_parameters(suite_id=1, aux_list=[aux1, aux2])
  class SuiteSetup(pykiso.BasicTestSuiteSetup):
      def test_suite_setUp():
          logging.info("I HAVE RUN THE TEST SUITE SETUP!")
          if aux1.not_properly_configured():
              aux1.configure()
          aux2.configure()
          callback_registering()

"""
Add test suite teardown fixture, run once at test suite's end.
Test Suite Teardown Information:
-> suite_id : set to 1
-> case_id : Parameter case_id is not mandatory for setup.
-> aux_list : used aux1 and aux2 is used
"""
  @pykiso.define_test_parameters(suite_id=1, aux_list=[aux1, aux2])
  class SuiteTearDown(pykiso.BasicTestSuiteTeardown):
      def test_suite_tearDown():
          logging.info("I HAVE RUN THE TEST SUITE TEARDOWN!")
          callback_unregistering()

"""
Add a test case 1 from test suite 1 using auxiliary 1.
  Test Suite Teardown Information:
-> suite_id : set to 1
-> case_id : set to 1
-> aux_list : used aux1 and aux2 is used
-> test_ids: [optional] store the requirements into the report
-> tag: [optional] dictionary containing lists of variants and/or test levels when only␣
↪a subset of tests needs to be executed
"""
  @pykiso.define_test_parameters(
```

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```
        suite_id=1,
        case_id=1,
        aux_list=[aux1, aux2],
        test_ids={"Component1": ["Req1", "Req2"]},
        tag={"variant": ["variant2", "variant1"], "branch_level": ["daily", "nightly"]}
↪,
 )
 class MyTest(pykiso.BasicTest):
     pass
```

### 4.2.2 Implementation of Advanced Tests - Auxiliary Interaction

Using the dynamic importing capabilities of the framework we can interact with the auxiliaries directly.

For this test we will assume that we have configured a *CommunicationAuxiliary* and a connector that supports *raw* messaging.

```
"""
send a message, receive a response, compare to expected response
"""
import pykiso
from pykiso.auxiliaries import com_aux

@pykiso.define_test_parameters(suite_id=2, case_id=1, aux_list=[com_aux])
class ComTest(pykiso.BasicTest):

    STIMULUS = b"stimulus message"
    RESPONSE = b"expected reply"

    def test_run(self):
        com_aux.send_message(STIMULUS)
        resp = com_aux.receive_message()
        self.assertEqual(resp, RESPONSE)
```

We can use the configured and instantiated auxiliary `com_aux` (imported by it's alias) in the test directly.

### 4.2.3 Implementation of Advanced Tests - Custom Setup

If you need to have more complex tests, you can do the following:

- `BasicTest` is a specific implementation of `unittest.TestCase` therefore it contains 3 steps/methods **setUp()**, **tearDown()** and **test_run()** that can be overwritten.
- `BasicTest` will contain the list of **auxiliaries** you can use. It will be hold in the attribute `test_auxiliary_list`.
- `BasicTest` also contains the following information `test_section_id`, `test_suite_id`, `test_case_id`.
- Import *logging* or/and *message* (if needed) to communicate with the **auxiliary**(in that case use RemoteTest instead of BasicTest)

**test_suite_2.py**:

```
"""
I want to run the following tests documented in the following test-specs <TEST_CASE_
↪SPECS>.
"""
import pykiso
from pykiso import message
from pykiso.auxiliaries import aux1


@pykiso.define_test_parameters(suite_id=2, case_id=1, aux_list=[aux1])
class MyTest(pykiso.BasicTest):
    def setUp(self):
        # I loop through all the auxiliaries
        for aux in self.test_auxiliary_list:
            if aux.name == "aux1": # If I find the auxiliary to which I need to send a␣
↪special message, I compose the message and send it.
                # Compose the message to send with some additional information
                tlv = { TEST_REPORT:"Give me something" }
                testcase_setup_special_message = message.Message(msg_type=message.
↪MessageType.COMMAND, sub_type=message.MessageCommandType.TEST_CASE_SETUP,
                                                                 test_section=self.test_section_id,
↪ test_suite=self.test_suite_id, test_case=self.test_case_id, tlv_dict=tlv)
                # Send the message
                aux.run_command(testcase_setup_special_message, blocking=True, timeout_in_
↪s=10)
            else: # Do not forget to send a setup message to the other auxiliaries!
                # Compose the normal message
                testcase_setup_basic_message = message.Message(msg_type=message.
↪MessageType.COMMAND, sub_type=message.MessageCommandType.TEST_CASE_SETUP,
                                                               test_section=self.test_section_id,
↪ test_suite=self.test_suite_id, test_case=self.test_case_id)
                # Send the message
                aux.run_command(testcase_setup_basic_message, blocking=True, timeout_in_
↪s=10)
```

### 4.2.4 Implementation of Advanced Tests - Test Templates

Because we are python based, you can until some extend, design and implement parts of the framework to fulfil your needs. For example:

**test_suite_3.py**:

```
import pykiso
from pykiso import message
from pykiso.auxiliaries import aux1


class MyTestTemplate(pykiso.BasicTest):
    def test_run(self):
        # Prepare message to send
        testcase_run_message = message.Message(msg_type=message.MessageType.COMMAND, sub_
↪type=message.MessageCommandType.TEST_CASE_RUN,
```

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```
                                                    test_section=self.test_section_id,␣
↪test_suite=self.test_suite_id, test_case=self.test_case_id)
        # Send test start through all auxiliaries
        for aux in self.test_auxiliary_list:
            if aux.run_command(testcase_run_message, blocking=True, timeout_in_s=10) is␣
↪not True:
                self.cleanup_and_skip("{} could not be run!".format(aux))
        # Device will reboot, wait for the reboot report
        for aux in self.test_auxiliary_list:
            if aux.name == "DeviceUnderTest":
                report = aux.wait_and_get_report(blocking=True, timeout_in_s=10) # Wait␣
↪for a report from the DeviceUnderTest
                break
        # Check if the report for the reboot was received.
        report is not None and report.get_message_type() == message.MessageType.REPORT␣
↪and report.get_message_sub_type() == message.MessageReportType.TEST_PASS:
            pass # We can continue
        else:
            self.cleanup_and_skip("Device failed rebooting")
        # Loop until all reports are received
        list_of_aux_with_received_reports = [False]*len(self.test_auxiliary_list)
        while False in list_of_aux_with_received_reports:
            # Loop through all auxiliaries
            for i, aux in enumerate(self.test_auxiliary_list):
                if list_of_aux_with_received_reports[i] == False:
                    # Wait for a report
                    reported_message = aux.wait_and_get_report()
                    # Check the received message
                    list_of_aux_with_received_reports[i] = self.evaluate_message(aux,␣
↪reported_message)

@pykiso.define_test_parameters(suite_id=3, case_id=1, aux_list=[aux1])
class MyTest(MyTestTemplate):
   pass

@pykiso.define_test_parameters(suite_id=3, case_id=2, aux_list=[aux1])
class MyTest2(MyTestTemplate):
   pass
```

### 4.2.5 Implementation of Advanced Tests - Repeat testCases

Decorator: retry mechanism for testCase.

The aim is to cover the 2 following cases:

- Unstable test : get the test pass within the {max_try} attempt
- Stability test : run {max_try} time the test expecting no error

The **retry_test_case** comes with the possibility to re-run the setUp and tearDown methods automatically.

**type max_try** `int`

**param max_try** maximum number of try to get the test pass.

**type rerun_setup** bool

**param rerun_setup** call the "setUp" method of the test.

**type rerun_teardown** bool

**param rerun_teardown** call the "tearDown" method of the test.

**type stability_test** bool

**param stability_test** run {max_try} time the test and raise an exception if an error occurs.

**return** None, a testCase is not supposed to return anything.

**raise Exception** if stability_test, the exception that occurred during the execution; if not stability_test, the exception that occurred at the last try.

**test_suite_1.py**:

```
# define an external iterator that can be used for retry_test_case demo
side_effect = cycle([False, False, True])

@pykiso.define_test_parameters()
class MyTest1(pykiso.BasicTest):
    """This test case definition will override the setUp, test_run and tearDown method."
↪"

    @pykiso.retry_test_case(max_try=3)
    def setUp(self):
        """Hook method from unittest in order to execute code before test case run.
        In this case the default setUp method is overridden, allowing us to apply the
        retry_test_case's decorator. The syntax super() access to the BasicTest and
        we will run the default setUp()
        """
        super().setUp()

    @pykiso.retry_test_case(max_try=5, rerun_setup=True, rerun_teardown=False)
    def test_run(self):
        """In this case the default test_run method is overridden and
        instead of calling test_run from BasicTest class the following
        code is called.

        Here, the test pass at the 3rd attempt out of 5. The setup and
        tearDown methods are called for each attempt.
        """
        logging.info(
            f"--------------- RUN: {self.test_suite_id}, {self.test_case_id} ------------
↪---"
        )
        self.assertTrue(next(side_effect))
        logging.info(f"I HAVE RUN 0.1.1 for variant {self.variant}!")

    @pykiso.retry_test_case(max_try=3, stability_test=True)
    def tearDown(self):
        """Hook method from unittest in order to execute code after the test case ran.
        In this case the default tearDown method is overridden, allowing us to apply the
        retry_test_case's decorator. The syntax super() access to the BasicTest and
```

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```
        we will run the default tearDown().

        The retry_test_case has stability test activated, so the tearDown method will
        be run 3 times.
        """
        super().tearDown()
```

### 4.2.6 Test verbosity

```
pykiso -c <config_file>
```

To let the user decide which information they want to see in their logs, new log levels have been defined. When launched normally, only the logs from the tests and the framework errors will be active. The option -v (–verbose) should be used to display the internal logs of the framework:

```
pykiso -c <config_file> -v
```

or

```
pykiso -c <config_file> --verbose
```

Three internal log levels are available: INTERNAL_INFO, INTERNAL_DEBUG, INTERNAL_WARNING. They will then be activated depending on the value of the–log-level option. Error logs level will always be logged, internal or not.

The summary of the activated logs depending of the value of the –log-level and –verbose options can be found in the following table:

| | verbose == True | verbose == False |
|---|---|---|
| log-level == DEBUG | DEBUG, INTERNAL_DEBUG, INFO, INTERNAL_INFO, WARNING, INTERNAL_WARNING, ERROR | DEBUG, INFO, WARNING, ERROR |
| log-level == INFO | INFO, INTERNAL_INFO, WARNING, INTERNAL_WARNING, ERROR | INFO, WARNING, ERROR |
| log-level == WARNING | WARNING, INTERNAL_WARNING, ERROR | WARNING, ERROR |
| log-level == ERROR | ERROR | ERROR |

### 4.2.7 Run single tests

Test case can be selected with the -p or –pattern flag. Here is an example to just override the test file:

```
pykiso -c dummy.yaml -p test_suite_1.py
```

It is also possible to select single or multiple test cases by extending the pattern. Test classes and single test methods can be selected. The pattern can consist 3 elements separated by a "::". Each element is a unix file name pattern.

The elements are file_name::test_class_name::test_method_name

Here some examples:

```
#select a single test
pykiso -c dummy.yaml -p test_suite_1.py::TestClass::test_run1
```

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```
#select all test methods which begins with test_
pykiso -c dummy.yaml -p test_suite_1.py::TestClass::test_*

#select all test classes which starts with Test and run method test_run1
pykiso -c dummy.yaml -p test_suite_1.py::Test*::test_run1

#use file pattern from yaml file and select all test classes and run method test_run1
pykiso -c dummy.yaml -p ::*::test_run1
```

## 4.3 Access framework's configuration

All parameters given at CLI and yaml level are available for each test cases/suites. For a convenient usage, all configuration information are class based represented. This means each parameter is accessible like a "normal" instance attribute (dot-access) and the attribute's name is simply the one given in the yaml or the CLI level.

Each parameter stored in GlobalConfig's yaml and CLI attributes is read-only.

> **Warning:** assign a new value will automatically raise an AttributeError

Let's admit we have the following yaml configuration file:

```
auxiliaries:
  aux1:
    connectors:
        com: chan1
    config: null
    type: pykiso.lib.auxiliaries.dut_auxiliary:DUTAuxiliary
  aux2:
    connectors:
        com:   chan2
        flash: chan3
    type: pykiso.lib.auxiliaries.dut_auxiliary:DUTAuxiliary
  aux3:
    connectors:
        com:   chan4
    type: pykiso.lib.auxiliaries.dut_auxiliary:DUTAuxiliary
connectors:
  chan1:
    config:
      param_1: "value 1"
      param_2: 2000
    type: ext_lib/cc_example.py:CCExample
  chan2:
    type: ext_lib/cc_example.py:CCExample
  chan4:
    type: ext_lib/cc_example.py:CCExample
  chan3:
    config: ~
```

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```
    type: pykiso.lib.connectors.cc_flasher_example:FlasherExample
test_suite_list:
- suite_dir: conf_access
  test_filter_pattern: '*.py'
  test_suite_id: 1
```

And we passed the following arguments at the command line interface:

```
pykiso -c examples/conf_access.yaml --variant variant1 --variant daily --log-level INFO --verbose
```

To access all those parameters contain in both sources (cli and yaml) :

```
##########################################################################
# Copyright (c) 2010-2022 Robert Bosch GmbH
# This program and the accompanying materials are made available under the
# terms of the Eclipse Public License 2.0 which is available at
# http://www.eclipse.org/legal/epl-2.0.
#
# SPDX-License-Identifier: EPL-2.0
##########################################################################

"""
Configuration access example
****************************

:module: test_access

:synopsis: just a basic example on how to access configuration
    information fron test case level
"""

import logging

import pykiso
from pykiso.auxiliaries import aux1, aux2, aux3
from pykiso.global_config import GlobalConfig

# get all parameters given at yaml configuration level
yaml_config = GlobalConfig().yaml
# store all auxiliaries configuration
aux_config = yaml_config.auxiliaries
# store all connectors configuration
con_config = yaml_config.connectors
# get all parameters given at cli level
cli_config = GlobalConfig().cli


@pykiso.define_test_parameters(
    suite_id=1,
    case_id=1,
    aux_list=[aux1, aux2],
```

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```
    setup_timeout=1,
    teardown_timeout=1,
    tag={"variant": ["variant2", "variant1"], "branch_level": ["daily", "nightly"]},
)
class MyTest1(pykiso.BasicTest):
    """Simply Test case use to show configuraton parameters access."""

    def setUp(self):
        """Just print all given cli parameters."""
        logging.info(
            f"--------------- SETUP: {self.test_suite_id}, {self.test_case_id} ----------
↪-----"
        )
        logging.info("*** print all parameters given at cli level ***")
        logging.info(f"loaded configuration file: {cli_config.test_configuration_file}")
        logging.info(f"logging text file path: {cli_config.log_path}")
        logging.info(f"log level: {cli_config.log_level}")
        logging.info(f"report type: {cli_config.report_type}")
        logging.info(f"variant filter: {cli_config.variant}")
        logging.info(f"branch level: {cli_config.branch_level}")
        logging.info(f"pattern: {cli_config.pattern}")

    def test_run(self):
        """Just verify some configuration values."""
        logging.info(
            f"--------------- RUN: {self.test_suite_id}, {self.test_case_id} ------------
↪---"
        )
        if yaml_config.auxiliaries.aux2.connectors.flash == "chan3":
            logging.info("Auxiliary aux2 has a flasher")

        # just make a simple assertion in order to raise an error and
        # stop test execution if a specific value is not given to chan1
        # connector
        self.assertEqual(yaml_config.connectors.chan1.config.param_1, "value 1")

    def tearDown(self):
        """Just print aux2 configuration and it related connector too."""
        logging.info(
            f"---------------TEARDOWN: {self.test_suite_id}, {self.test_case_id} --------
↪-------"
        )
        logging.info("*** print aux2 configuration ***")
        logging.info(f"auxiliary aux2 flasher: {aux_config.aux2.connectors.flash}")
        logging.info(f"auxiliary aux2 connector: {aux_config.aux2.connectors.com}")

        logging.info("*** print associated connector configuration ***")
        logging.info(
            f"channel chan1 param 1: {yaml_config.connectors.chan1.config.param_1}"
        )
        logging.info(
            f"channel chan1 param 2: {yaml_config.connectors.chan1.config.param_2}"
```

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```
        )
        logging.info(f"channel chan1 type: {yaml_config.connectors.chan1.type}")
        logging.info(f"connector chan2 type: {yaml_config.connectors.chan2.type}")
```

**Note:** the GlobalConfig class is a singleton, so one and only one instance is created during the whole execution time

## 4.4 Dynamic Configuration

In some situation, it can be useful to change the behaviour of the auxiliary in-use dynamically. For example, switching for a brand new channel or simply change an attribute value.

Thanks to the common auxiliary interface, users can easily change their auxiliary configuration by simply stop it (call of delete_instance public method) ,access it different public attributes, and then just restarts the auxiliary (call of the public method `delete_instance`)

**Warning:** if you are using the original auxiliary instance don't forget to switch back to its initial configuration for the next test cases.

Find below a complete example where during the test, the current pcan connector is replaced by a simple CCLoopback:

```
import logging
import time

import pykiso

# as usual import your auxiliairies
from pykiso.auxiliaries import aux1, aux2, proxy_aux
from pykiso.lib.connectors.cc_raw_loopback import CCLoopback


@pykiso.define_test_parameters(
    suite_id=2,
    case_id=3,
    aux_list=[aux1, aux2],
)
class TestCaseOverride(pykiso.BasicTest):
    """In this test case we will simply use 2 communication auxiliaries
    bounded with a proxy one. The first communication auxiliary will be
    used for sending and the other one for the reception
    """

    def setUp(self):
        """If a fixture is not use just override it like below."""
        logging.info(
            f"--------------- SETUP: {self.test_suite_id}, {self.test_case_id} ----------
↪-----"
        )
```

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```
        # start auxiliary one and two because I need it
        aux1.start()
        aux2.start()
        # start the proxy auxiliary in order to open the connector
        proxy_aux.start()

    def test_run(self):
        """Just send some raw bytes using aux1 and log first 100
        received messages using aux2.
        """
        logging.info(
            f"--------------- RUN: {self.test_suite_id}, {self.test_case_id} ------------
↪---"
        )

        logging.info(f">> Send and receive message using the connected pcan <<")

        logging.info(f"send 300 messages using aux1/aux2")
        # just send some requests
        self._send_messages(300)
        # log the first 100 received messages, with the aux2
        self._receive_message(100)

        logging.info(
            f">> Change proxy_aux channel dynamically and continue to send/receive <<"
        )

        logging.info(f"Stop current running auxiliaries")
        self._stop_auxes()

        # save current channel used by the proxy
        self.pcan_channel = proxy_aux.channel
        # change proxy attached channel to CCLoopback
        proxy_aux.channel = CCLoopback()

        logging.info(f"Restart all auxiliaries")
        self._start_auxes()

        logging.info(f">> Send and receive message using the connected CCLoopback <<")

        logging.info(f"send 30 messages using aux1/aux2")
        # just send some requests
        self._send_messages(10)
        # log the first 10 received messages, with the aux2
        self._receive_message(10)

        logging.info(
            f">> Switch back to the pcan channel and continue to send/receive <<"
        )

        logging.info(f"Stop current running auxiliaries")
        self._stop_auxes()
```

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```
        # switch back with pcan connector
        proxy_aux.channel = self.pcan_channel

        logging.info(f"Restart all auxiliaries")
        self._start_auxes()

        logging.info(f">> Send and receive message using the connected initial pcan <<")

        logging.info(f"send 30 messages using aux1/aux2")
        # just send some requests
        self._send_messages(10)
        # log the first 10 received messages, with the aux2
        self._receive_message(10)

    def _stop_auxes(self) -> None:
        """Stop all auxiliaries currently in use."""
        # always stop the proxy auxiliary at the end
        aux1.delete_instance()
        aux2.delete_instance()
        proxy_aux.delete_instance()

    def _start_auxes(self) -> None:
        """Start all configured auxiliaries."""
        # always start the proxy auxiliary at the end
        aux1.create_instance()
        aux2.create_instance()
        proxy_aux.create_instance()

    def _send_messages(self, nb_msg: int) -> None:
        """Send n messages a defined number of times.

        :param nb_msg: number of messages pack to send
        """
        for _ in range(nb_msg):
            # send random messages using aux1
            aux1.send_message(b"\x01\x02\x03")
            aux2.send_message(b"\x04\x05\x06")
            aux1.send_message(b"\x07\x08\x09")

    def _receive_message(self, nb_msg: int) -> None:
        """Get messages from the reception queue.

        :param nb_msg: number of messages to dequeue
        """
        for _ in range(nb_msg):
            logging.info(f"received message: {aux2.receive_message()}")

    def tearDown(self):
        """If a fixture is not use just override it like below."""
        logging.info(
            f"--------------- TEARDOWN: {self.test_suite_id}, {self.test_case_id} -------
↪--------"
```

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```
)
```

**Warning:** this feature allows to change the complete auxiliary configuration, so depending on which parameters are changed the auxiliary execution could lead to unexpected behaviors.

## 4.5 Remote Test

With the remote test approach, the idea is to execute tests on the targeted hardware to enable the developer to practice test-driven-development directly on the target.

### 4.5.1 Test Coordinator

In the case of remote tests usage, the **test-coordinator** will still perform the same task but will also:

- verify if the tests can be performed
- flash and run and synchronize the tests on the *device under test*

### 4.5.2 Auxiliary

For the remote test approach, auxiliaries should be composed by 2 blocks:

- physical or digital instance creation / deletion (e.g. flash the *device under test* with the testing software, e.g. Start a docker container)
- connectors to facilitate interaction and communication with the device (e.g. flashing via *JTAG*, messaging with *UART*)

One example of implementation of such an auxiliary is the *device under test* auxiliary used with the TestApp. In this specific case we have:

- As communication channel (**cchannel**) usually *UART*
- As flashing channel (**flashing**) usually *JTAG*

### 4.5.3 Connector

#### Communication Channel

In case of the *device under test*, we have a specific communication protocol. Please see the next paragraph.

#### Flasher

The Flasher Connectors usually provide only one method, *flash()*, which will transfer the configured binary file to the target.

### 4.5.4 Message Protocol

The message protocol is used (but not only) between the *device under test* HW and its **test-auxiliary**. The communication pattern is as follows:

1. The test manager sends a message that contains a test command to a test participant.
2. The test participant sends an acknowledgement message back.
3. The test participant may send a report message.
4. The test manager replies to a report message with an acknowledgement message.

The message structure is as follow:

```
0               1               2               3
0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7 0
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|Ver| MT|  Res  |   Msg Token   |   Sub-Type    | Error code    |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
| Test Section  |  Test Suite   |   Test Case   | Payload length|
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
| Payload (in TLV format)
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

It consist of:

| Code | size (in bytes) | Explanation |
|---|---|---|
| Ver (Version) | 2 bits | Indicates the version of the test c oordination protocol. |
| MT (Message Type) | 2 bits | Indicates the type of the message. |
| Res (Reserved) | 4 bits | |
| Msg Token (Message Token) | 1 | Arbitrary byte. It must not be repeated for 10 consecutive messages. In the ackn owledgement message the same token must be used. |
| Sub-Type (Message Sub Type) | 1 | Gives more information about the message type |
| Error Code | 1 | Error code that can be used by the auxiliaries to forward an error |
| Test Section | 1 | Indicates the test section number |
| Test Suite | 1 | Indicates the test suite number which permits to identify a test suite within a test section |
| Test Case | 1 | Indicates the test case number which permits to identify a test case within a test suite |
| Payload Length | 1 | Indicate the length of the payload composed of TLV elements. If 0, it means there is no payload |
| Payload | X | Optional, list of TLVs elements. One TLV has 1 byte for the *Tag*, 1 byte for the *length*, up to 255 bytes for the *Value* |

The **message type** and **message sub-type** are linked and can take the following values:

| Type | Type Id | Sub-type | Sub-type Id | Ex planation |
|---|---|---|---|---|
| COM-MAND | 0 | PING | 0 | For ping-pong between the auxiliary to verify if a comm unication is es tablished |
| | | TEST_SECTION_SETUP | 1 | |
| | | TEST_SUITE_SETUP | 2 | |
| | | TEST_CASE_SETUP | 3 | |
| | | TEST_SECTION_RUN | 11 | |
| | | TEST_SUITE_RUN | 12 | |
| | | TEST_CASE_RUN | 13 | |
| | | TE ST_SECTION_TEARDOWN | 21 | |
| | | TEST_SUITE_TEARDOWN | 22 | |
| | | TEST_CASE_TEARDOWN | 23 | |
| | | ABORT | 99 | |
| RE-PORT | 1 | TEST_PASS | 0 | |
| | | TEST_FAILED | 1 | |
| | | TEST_NOT_IMPLEMENTED | 2 | |
| ACK | 2 | ACK | 0 | |
| | | NACK | 1 | |
| LOG | 3 | RESERVED | 0 | |

The TLV only supported *Tag* are:

- TEST_REPORT = 110
- FAILURE_REASON = 112

### 4.5.5 Flashing

The flashing is usually needed to put the test-software containing the tests we would like to run into the *Device under test* . Flashing is done via a flasher connector, which has to be configured with the correct binary file. The flasher connector is in turn called from an appropriate auxiliary (usually in its setup phase).

### 4.5.6 Implementation of Remote Tests

For remote tests, RemoteTestCase / RemoteTestSuite should be used instead of BasicTestCase / BasicTestSuite, based on Message Protocol, users can configure the maximum time (in seconds) used to wait for a report. This "timeout" is configurable for each available fixtures :

- setup_timeout : the maximum time (in seconds) used to wait for a report during setup execution (optional)
- run_timeout : the maximum time (in seconds) used to wait for a report during test_run execution (optional)
- teardown_timeout : the maximum time (in seconds) used to wait for a report during teardown execution (optional)

**Note:** by default those timeout values are set to 10 seconds.

Find below a full example for a test suite/case declaration in case the Message Protocol / TestApp is used:

```
"""
Add test suite setup fixture, run once at test suite's beginning.
Test Suite Setup Information:
-> suite_id : set to 1
-> case_id : Parameter case_id is not mandatory for setup.
-> aux_list : used aux1 and aux2 is used
-> setup_timeout : time to wait for a report 5 seconds
-> run_timeout : Parameter run_timeout is not mandatory for test suite setup.
-> teardown_timeout : Parameter run_timeout is not mandatory for test suite setup.
"""
  @pykiso.define_test_parameters(suite_id=1, aux_list=[aux1, aux2], setup_timeout=5)
  class SuiteSetup(pykiso.RemoteTestSuiteSetup):
      pass

"""
Add test suite teardown fixture, run once at test suite's end.
Test Suite Teardown Information:
-> suite_id : set to 1
-> case_id : Parameter case_id is not mandatory for setup.
-> aux_list : used aux1 and aux2 is used
-> setup_timeout : Parameter run_timeout is not mandatory for test suite teardown.
-> run_timeout : Parameter run_timeout is not mandatory for test suite teardown.
-> teardown_timeout : time to wait for a report 5 seconds
"""
  @pykiso.define_test_parameters(suite_id=1, aux_list=[aux1, aux2], teardown_timeout=5,)
  class SuiteTearDown(pykiso.RemoteTestSuiteTeardown):
      pass

"""
Add a test case 1 from test suite 1 using auxiliary 1.
  Test Suite Teardown Information:
-> suite_id : set to 1
-> case_id : set to 1
-> aux_list : used aux1 and aux2 is used
-> setup_timeout : time to wait for a report 3 seconds during setup
-> run_timeout : time to wait for a report 10 seconds during test_run
-> teardown_timeout : time to wait for a report 3 seconds during teardown
-> test_ids: [optional] store the requirements into the report
-> tag: [optional] dictionary containing lists of variants and/or test levels when only␣
↪a subset of tests needs to be executed
"""
  @pykiso.define_test_parameters(
          suite_id=1,
          case_id=1,
          aux_list=[aux1, aux2],
          setup_timeout=3,
          run_timeout=10,
          teardown_timeout=3,
          test_ids={"Component1": ["Req1", "Req2"]},
          tag={"variant": ["variant2", "variant1"], "branch_level": ["daily", "nightly"]}
↪,
  )
  class MyTest(pykiso.RemoteTest):
```

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```
        pass
```

### 4.5.7 Config File for remote tests

For details see *How to make the most of the config file*.

Find below an example of config for used for remote testing (is that case using *device under test* auxiliary)

```yaml
auxiliaries:
  fdx_aux:
    connectors:
      com: fdx_channel
      flash: flash_lauterbach
    config: null
    type: pykiso.lib.auxiliaries.dut_auxiliary:DUTAuxiliary
connectors:
  #  Every path can be set as absolute or relative to the yaml file
  #  Todo: Fix the cmm dependencies in order to not be compulsory to run the tests from␣
↪the cmm's folder
  fdx_channel:
    config:
      t32_exc_path: 'Path/to/Trace32.exe'
      t32_config: '../path/to/config.t32'
      t32_main_script_path: '../path/to/TAPP_Demo.cmm'
      t32_reset_script_path: '../path/to/reset.cmm'
      t32_api_path: 'path/to/trace32.dll'
      port: '20000'
      node: 'localhost'
      packlen: '1024'
      device: 1
    type: pykiso.lib.connectors.cc_fdx_lauterbach:CCFdxLauterbach
  flash_lauterbach:
    config:
      t32_exc_path: 'Path/to/Trace32.exe'
      t32_config: '../path/to/config.t32'
      t32_main_script_path: '../path/to/TAPP_Demo.cmm'
      t32_reset_script_path: '../path/to/reset.cmm'
      t32_api_path: 'path/to/trace32.dll'
      port: '20000'
      node: 'localhost'
      packlen: '1024'
      device: 1
    type: pykiso.lib.connectors.flash_lauterbach:LauterbachFlasher

test_suite_list:
- suite_dir: test_suite_fdx_lauterbach
  test_filter_pattern: 'test*.py'
  test_suite_id: 1
```

## 4.6 System-test (step) report

The step report aims to provide a more comprehensive test-report (adapted for system testers) by tracking each assertion that contains a message. It follows the following structure:

- test name
- test description
- date of execution
- elapsed time
- information gathered during test
- assertion detail: - value of the data_in - variable name of the data_in - expected value - message
- the report is presented as an HTML page

### 4.6.1 Usage Examples

```
def setUp(self):
    # data to test
    device_on = True
    voltage = 3.8

    # assert
    self.assertTrue(device_on, msg="Check my device is ready")

    # assert fail but continue on error
    # test is set to failed if assertion does not succeed
    self.step_report.continue_on_error = True
    self.assertFalse(device_on, msg="Some check")

    # assert with custom message
    # assert msg overwritten when step_report_message not null
    self.step_report.message = "Custom message"
    self.assertAlmostEqual(voltage, 4, delta=1, msg="Check voltage device")

    # additional data to include in the step-report
    self.step_report.header["Version_device"] = "2022-1234"
```

“self.step_report.header” allows you to store data data during test

### 4.6.2 How to generate

```
pykiso -c my_config.yaml --step-report my_report.html
```

## 4.7 Multiprocessing

### 4.7.1 Introduction

In addition to the auxiliary's thread based implementation, the multiprocessing approach is possible too. A dedicated multiprocessing auxiliary interface is available and has the same capabilities/methods as the thread based interface.

**Note:** all examples are under examples/templates/mp_proxy_aux.yaml

### 4.7.2 Basic Users

For the moment, only the proxy auxiliary and proxy channel have their own multiprocessing version. The usage of those components only require to manipulate the flag newly created flag "processing" at connector configuration level as follow :

```
#_____________________________ Auxiliaries section _____________________________
# The multiprocessing proxy auxiliary has exactly the same interface,
# methods, or features as the thread based one. In addition, exactly
# the same configuration keywords are available.
auxiliaries:
  proxy_aux:
    connectors:
        com: can_channel
    config:
      aux_list : [aux1, aux2]
      activate_trace : True
      trace_dir: ./suite_mp_proxy
      trace_name: can_trace
      activate_log :
        - pykiso.lib.auxiliaries.mp_proxy_auxiliary
    type: pykiso.lib.auxiliaries.mp_proxy_auxiliary:MpProxyAuxiliary
  aux1:
    connectors:
        com: proxy_com1
    type: pykiso.lib.auxiliaries.communication_auxiliary:CommunicationAuxiliary
  aux2:
    connectors:
        com: proxy_com2
    type: pykiso.lib.auxiliaries.communication_auxiliary:CommunicationAuxiliary

#_____________________________ Connectors section _____________________________
connectors:
  proxy_com1:
    config:
      # when using mulitprocessing auxiliary flag processing has to True
      processing : True
    type: pykiso.lib.connectors.cc_mp_proxy:CCMpProxy
  proxy_com2:
    config:
      # when using mulitprocessing auxiliary flag processing has to True
```

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```
      processing : True
    type: pykiso.lib.connectors.cc_mp_proxy:CCMpProxy
  can_channel:
    config:
      # when using mulitprocessing auxiliary flag processing has to True
      processing : True
      interface : 'pcan'
      channel: 'PCAN_USBBUS1'
      state: 'ACTIVE'
      remote_id : 0x300
    type: pykiso.lib.connectors.cc_pcan_can:CCPCanCan
#_____________________________ Test Suite section _____________________________
test_suite_list:
- suite_dir: suite_proc_proxy
  test_filter_pattern: 'test_*.py'
  test_suite_id: 2
```

### 4.7.3 Advanced Users

As said before, the approach changes but the interface usage stays the same. Advanced user will not be disorientated, all methods are there. They were just adapted regarding multiprocessing pros and cons:

- lock_it
- unlock_it
- create_instance
- delete_instance
- run_command
- abort_command
- wait_and_get_report
- stop
- resume
- suspend

And inherit from the MpAuxiliaryInterface forces you to implement the following methods (as usual):

- _create_auxiliary_instance
- _delete_auxiliary_instance
- _run_command
- _abort_command
- _receive_message

So nothing really new !!

> **Warning:** note that using multiprocessing auxiliary may lead to an adaptation of your connector implementation or your external libraries.

### 4.7.4 Limitations

#### Junit report logging

Logging in junit report is not supported when using multiprocesssing version of the proxy auxiliary. This means no logs from proxy auxiliary and his associated connectors (except proxy channels) will be present in junit report.

#### logging on stdout

All logs coming from proxy's associated connectors (except proxy channels) won't be displayed on the console.

## 4.8 How to create an auxiliary

This tutorial aims to explain the working principle of an Auxiliary by providing information on the different Auxiliary interfaces, their purpose and the implementation of new auxiliaries.

To provide hints on the implementation of an Auxiliary, an example that implements a generic auxiliary is provided, that is not usable but shall explain the different concepts and implementation steps.

### 4.8.1 Different Auxiliary interfaces for different use-cases

Pykiso provides three different auxiliary interfaces, used as basis for any implemented auxiliary. These different interfaces aim to cover every possible usage of an auxiliary:

- The *AuxiliaryInterface* is a Thread-based auxiliary. It is suited for IO-bound tasks where the reception of data cannot be expected.
- The *MpAuxiliaryInterface* is a Process-based auxiliary. It is suited for CPU-bound tasks where the reception of data cannot be expected and its processing can be CPU-intensive. In contrary to the Thread-based auxiliary, this interface is not limited by the GIL and runs on all available CPU cores.
- The *SimpleAuxiliaryInterface* does not implement any kind of concurrent execution. It is suited for host-based applications where the auxiliary initiates every possible action, i.e. the reception of data can always be expected.
- The *DTAuxiliaryInterface* is a double threaded base auxiliary, where a thread is used for the transmission and a second one for the reception. It is suited for IO-bound tasks where the reception of data cannot be expected.

### 4.8.2 Execution of an Auxiliary

#### Auxiliary creation and deletion

Any auxiliary is **created** at test setup (before any test case is executed) by calling *create_instance()* and **deleted** at test teardown (after all test cases have been executed) by calling *delete_instance()*.

These methods set the `is_instance attribute` that indicated if the auxiliary is running correctly.

### Concurrent auxiliary execution

The execution of concurrent auxiliaries (i.e. inheriting from *AuxiliaryInterface* or *MpAuxiliaryInterface*) is handled by the interfaces' *run()* method.

In the DTAuxiliaryInterface case, everything related to the tansmission is handled by `_transmit_task()` and for the reception by `_reception_task()`

Each command execution is handled in a thread-safe way by getting values from an input queue and returning the command result in an output queue.

### Auxiliary run

Each time the execution is entered, the following actions are performed:

1. Verify if a request is available in the input queue

1. If the command message is "create_auxiliary_instance" and the auxiliary is not created yet, call the `_create_auxiliary_instance()` method and put a boolean corresponding to the success of the command processing in the output queue. This command message is put in the queue at test setup.
2. If the command message is "delete_auxiliary_instance" and the auxiliary is created, call the `_delete_auxiliary_instance()` method and put a boolean corresponding the success of the command processing in the output queue. This command message is put in the queue at test teardown.
3. If the command message is a tuple of 3 elements starting with "command", then a custom command has to be executed. This custom command has to be implemented in the `_run_command()` method.
4. If the command message is "abort" and the auxiliary is created, call the `_abort_command()` method and put a boolean corresponding the success of the command processing in the output queue.

2. Verify if a Message is available for reception

1. Call the auxiliarie's `_receive_message()` method
2. If something is returned, put it in the output queue, otherwise repeat this execution cycle.

For an auxiliary based on DTAuxiliaryInterface, the execution is slightly different due to the usage of two threads:

1. Verify if a request is available in the input queue

1. If the command message is "DELETE_AUXILIARY" the transmit task while loop ends
2. If the command message is a tuple of 2 elements starting with your custom command type, and then the data to send. This custom command has to be implemented in the `_run_command()` method.

2. Verify if a Message is available for reception

1. Call the auxiliarie's `_receive_message()` and simpy wait for a message coming from the connector.
2. If something is returned, put it in the output queue, otherwise repeat this execution cycle.

### 4.8.3 Implement an Auxiliary

#### Common auxiliary methods

All of the above described Auxiliary interfaces require the same abstract methods to be implemented:

- `_create_auxiliary_instance()`: handle the auxiliary creation. Minimal actions to perform are opening the attached *CChannel*, to which can be added actions such as flashing the device under test, perform security related operations to allow the communication, etc.
- `_delete_auxiliary_instance()`: handle the auxiliary deletion. This method is the counterpart of `_create_auxiliary_instance`, so it needs to be implemented in a way that `_create_auxiliary_instance` can be called again without side effects. In the most basic case, it should at least close the opened *CChannel*.

#### Concurrent auxiliary methods

In addition to the previously described methods, the concurrent Auxiliary interfaces *AuxiliaryInterface* and *MpAuxiliaryInterface* require the following methods to be implemented:

- `_run_command()`: implement the different commands that should be performed by the Auxiliary. The public API methods of an auxiliary should always call the thread-safe *run_command()* method with arguments corresponding to the command to run, which will in turn call this private method.
- `_abort_command()`: implement the command abortion mechanism. This mechanism **must also be implemented on the target device**. A valid implementation for the TestApp protocol can be found in `pykiso.lib.auxiliaries.dut_auxiliary.DUTAuxiliary._abort_command()`.
- `_receive_message()`: implement the reception of data. This method should at least call the CChannel's *cc_receive()* method. The received data can then be decoded according to a particular protocol, matched against a previously sent request, or trigger any kind of further processing.

For the concurrent Auxiliary interface *DTAuxiliaryInterface*, only one significant difference :

- `_abort_command()`: is not mandatory

#### Auxiliary implementation example

See below an example implementing the basic functionalities of a Thread Auxiliary:

```
import logging
from pykiso import AuxiliaryInterface, CChannel, Flasher

# this auxiliary is thread-based, so it must inherit AuxiliaryInterface
class MyAuxiliary(AuxiliaryInterface):

    def __init__(self, channel: CChannel, flasher: Flasher, **kwargs):
        """Initialize Auxiliary attributes.

        Any auxiliary must at least be initialised with a CChannel.
        If needed, a Flasher can also be attached.

        Any additional parameter can be added depending on the implementation.

        The additional kwargs contain the auxiliarie's alias and logger
        names to keep activated, all defined in the configuration file.
```

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```
        """
        super().__init__(**kwargs)
        self.channel = channel
        self.flasher = flasher

    def _create_auxiliary_instance(self):
        """Create the auxiliary instance at test setup.

        This method is also called when running self.resume()

        Simply flash the device under test with the attached Flasher instance
        and open the communication with the attached CChannel instance.
        """
        logging.info("Flash target")
        # used as context manager to close the flashing HW (debugger)
        # after successful flash
        with self.flash as flasher:
            flasher.flash()

        logging.info("Open communication")
        self.channel.open()

    def _delete_auxiliary_instance(self):
        """Delete the auxiliary instance at test teardown.

        This method is also called when running self.suspend()

        Simply end the communication by closing the attached CChannel instance.
        """
        logging.info("Close communication")
        self.channel.close()

    def send(self, to_send):
        """Send data without waiting for any response."""

        # self._run_command(("command", "send", to_send)) will be called internally
        return self.run_command("send", to_send, timeout_in_s=0)

    def send_raw_bytes(self, to_send):
        """Send raw data without waiting for any response."""

        # self._run_command(("command", "send", to_send)) will be called internally
        return self.run_command("send raw", to_send, timeout_in_s=0)

    def send_and_wait_for_response(self, to_send, timeout = 1):
        """Send data and wait for a response during `timeout` seconds."""

        # returns True if the command was successfully executed
        command_sent = self.run_command("send", to_send, timeout_in_s=0)

        if command_sent:
            # method of AuxiliaryCommon that tries to get an element from queue_out
```

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```
            # queue_out is populated by self._receive_message()
            return self.wait_and_get_report(timeout_in_s=timeout)

    def _run_command(self, cmd_message, cmd_data):
        """Command execution method that is called internally by the
        AuxiliaryInterface Thread.

        Each public API method should call this method with a command message
        and the data corresponding to the command.

        The command message is then matched against every possible implemented
        message and the corresponding action is performed in a thread-safe way.

        In this example, only a "send" command is implemented that will simply
        send the command data over the attached communication channel.
        """
        if cmd_message == "send":
            # in the CChannel implementation raw is set to False by default
            # the data to send is then pre-serialized according to the specified protocol
            return self.channel.send(cmd_data)
        elif cmd_message == "send raw":
            # set raw to True to send raw bytes through the CChannel
            return self.channel.send(cmd_data, raw=True)

    def _abort_command(self):
        """Command abortion method that is called by the AuxiliaryInterface Thread
        when calling `my_aux.abort_command()`.

        Assume that the device under test aborts the running command when receiving
        the data b'abort'.

        For the sake of simplicity, no further check will be performed on the successful
        reception of the data by the DUT (e.g. wait for an acknowledgement).
        """
        command_sent = self.send_raw_bytes(b'abort')
        return command_sent

    def _receive_message(self):
        """Reception method that is called internally by the AuxiliaryInterface Thread.

        Verify if there is 'raw' data to receive for 10ms and return it.
        """
        try:
            received_data = self.channel.cc_receive(timeout=0.01, raw=True)
            if received_data is not None:
                return received_data
        except Exception:
            logging.exception(f"Channel {self.channel} failed to receive data")
```

Regarding a concrete implementation using *DTAuxiliaryInterface* take a look to *CommunicationAuxiliary* source code.

More examples are available under `pykiso.lib.auxiliaries`.

**Note:** If the created auxiliary should be based on multiprocessing instead of threading, only the base class needs to be changed from `AuxiliaryInterface` to `MpAuxiliaryInterface`. The actual implementation does not need any adaptation.

## 4.9 How to create a connector

On pykiso view, a connector is the communication medium between the auxiliary and the device under test. It can consist of two different blocks:

- a **communication channel**
- a **flasher**

Thus, its goal is to implement the sending and reception of data on the lower level protocol layers (e.g. CAN, UART, UDP).

Both can be used as context managers as they inherit the common interface *Connector*.

**Note:** Many already implemented connectors are available under `pykiso.lib.connectors`. and can easily be adapted for new implementations.

### 4.9.1 Communication Channel

In order to facilitate the implementation of a communication channel and to ensure the compatibility with different auxiliaries, pykiso provides a common interface *CChannel*.

This interface enforces the implementation of the following methods:

- *_cc_open()*: open the communication. Does not take any argument.
- *_cc_close()*: close the communication. Does not take any argument.
- *_cc_send()*: send data if the communication is open. Requires one positional argument `msg` and one keyword argument `raw`, used to serialize the data before sending it.
- *_cc_receive()*: receive data if the communication is open. Requires one positional argument `timeout` and one keyword argument `raw`, used to deserialize the data when receiving it.

#### Class definition and instanciation

To create a new communication channel, the first step is to define its class and constructor.

Let's admin that the following code is added to a file called **my_connector.py**:

```
import pykiso

MyCommunicationChannel(pykiso.CChannel):

    def __init__(self, arg1, arg2, kwarg1 = "default"):
        ...
```

Then, if this CChannel has to be used within a test, the test configuration file will derive from its location and constructor parameters:

```
connectors:
  my_chan:
    # provide the constructor parameters
    config:
      # arg1 and arg2 are mandatory as we defined them as positional arguments
      arg1: value for positional argument arg1
      arg2: value for positional argument arg2
      # kwarg1 is optional as we defined it as a keyword argument with a default value
      kwarg1: different value for keyword argument kwarg1
    # let pykiso know which class we want to instantiate with the provided parameters
    type: path/to/my_connector.py:MyCommunicationChannel
```

**Note:** If this file is located inside an installable package `my_package`, the type will become `type: my_package.my_connector:MyCommunicationChannel`.

### Interface completion

If the code above is left as such, it won't be usable as a connector as the communication channel's abstract methods aren't implemented.

Therefore, all four methods `_cc_open`, `_cc_close`, `_cc_send` and `_cc_receive` need to be implemented.

In order to complete the code above, let's assume that a module *my_connection_module* implements the communication logic.

The connector then becomes:

```
from my_connection_module import Connection
import pykiso

MyCommunicationChannel(pykiso.CChannel):

    def __init__(self, arg1, arg2, kwarg1 = "default"):
        # Connection class could be anything, like serial.Serial or socket.socket
        self.my_connection = Connection(arg1, arg2)

    def _cc_open(self):
        self.my_connection.open()

    def _cc_close(self):
        self.my_connection.close()

    def _cc_send(self, data: Union[Data, bytes], raw = False):
        if raw:
            data_bytes = data
        else:
            data_bytes = data.serialize()
        self.my_connection.send(data_bytes)
```

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```
    def _cc_receive(self, timeout, raw = False):
        received_data = self.my_connection.receive(timeout=timeout)
        if received_data:
            if not raw:
                data = Data.deserialize(received_data)
            return data
```

**Note:** The API used in this example for the fictive *my_connection* module entirely depends on the used module.

### Parameters and return values

In order to stay compatible and usable by the attached auxiliary, the created connector has to respect certain rules (in addition to the CChannel base class interface):

- **rule 1** : _cc_receive concrete implementation has to return a dictionary containing at least the key "msg". If more than the data received is return, for example the CAN ID from the emitter, just put it in the return dictionary.

see the example below with the cc_pcan_can connector and the return of the remote_id value :

```
def _cc_receive(
    self, timeout: float = 0.0001, raw: bool = False
) -> Dict[str, Union[MessageType, int]]:
    """Receive a can message using configured filters.

    If raw parameter is set to True return received message as it is (bytes)
    otherwise test entity protocol format is used and Message class type is returned.

    :param timeout: timeout applied on reception
    :param raw: boolean use to select test entity protocol format

    :return: the received data and the source can id
    """
    try:  # Catch bus errors & rcv.data errors when no messages where received
        received_msg = self.bus.recv(timeout=timeout or self.timeout)

        if received_msg is not None:
            frame_id = received_msg.arbitration_id
            payload = received_msg.data
            timestamp = received_msg.timestamp
            if not raw:
                payload = Message.parse_packet(payload)
            log.internal_debug(f"received CAN Message: {frame_id}, {payload}, {timestamp}
↪")
            return {"msg": payload, "remote_id": frame_id}
        else:
            return {"msg": None}
    except can.CanError as can_error:
        log.internal_debug(f"encountered can error: {can_error}")
        return {"msg": None}
    except Exception:
```

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```
        log.exception(f"encountered error while receiving message via {self}")
        return {"msg": None}
```

- **rule 2** : additional arguments associated to _cc_send concret implementation has to be named arguments and used the **kwargs

see example below with the cc_pcan_can connector and the additional remote_id parameter:

```
def _cc_send(self, msg: MessageType, raw: bool = False, **kwargs) -> None:
    """Send a CAN message at the configured id.

    If remote_id parameter is not given take configured ones, in addition if
    raw is set to True take the msg parameter as it is otherwise parse it using
    test entity protocol format.

    :param msg: data to send
    :param raw: boolean use to select test entity protocol format
    :param kwargs: named arguments

    """
    _data = msg
    remote_id = kwargs.get("remote_id")

    if remote_id is None:
        remote_id = self.remote_id
```

### 4.9.2 Flasher

pykiso provides a common interface for flashers *Flasher* that aims to be as simple as possible.

It only consists of 3 methods to implement:

- `open()`: open the communication with the flashing hardware if any (for e.g. JTAG flashing) and perform any preliminaly action
- *flash()*: perform all actions to flash the target device
- `close()`: close the communication with the flashing hardware.

---

**Note:** To ensure that a Flasher is closed after being opened, it should be used as a context manager (see *Auxiliary implementation example*).

---

CHAPTER

FIVE

# MODULES FOR USE

In *pykiso*, auxiliaries and connectors can be contributed. Some of them are more complex to use than others. All modules that need a more extensive documentation can be found here.

## 5.1 Controlling an acroname USB hub

The acroname auxiliary offers commands to control an acroname usb hub. Ports can be switched individually and their current and voltage can be measured. It is also possible to retrieve and set the current limitation of each port.

### 5.1.1 Usage Examples

To use the auxiliary in your test scripts the auxiliary must be properly defined in the config yaml. Example:

```yaml
auxiliaries:
    acro_aux:
      config:
        # Serial number to connect to. Example: "0x66F4859B"
        serial_number : null # null = auto detection.
      type: pykiso.lib.auxiliaries.acroname_auxiliary:AcronameAuxiliary
```

Below find a example for the usage in a test script. All available methods are shown there. For convenience units can be selected via a string. For current methods use ‘uA’, ‘mA’ or ‘A’. For voltage methods use ‘uV’, ‘mV’ or ‘V’. If not specified ‘V’ or ‘A’ will be used.

```python
##########################################################################
# Copyright (c) 2010-2022 Robert Bosch GmbH
# This program and the accompanying materials are made available under the
# terms of the Eclipse Public License 2.0 which is available at
# http://www.eclipse.org/legal/epl-2.0.
#
# SPDX-License-Identifier: EPL-2.0
##########################################################################

"""
Acroname auxiliary test
***********************

:module: test_acroname
```

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```
:synopsis: Example test that shows how to control the acroname usb.

.. currentmodule:: test_acroname

"""

import logging
import time

import pykiso
from pykiso.auxiliaries import acro_aux


@pykiso.define_test_parameters(suite_id=1, case_id=1, aux_list=[acro_aux])
class TestWithPowerSupply(pykiso.BasicTest):
    def setUp(self):
        """Hook method from unittest in order to execute code before test case run."""
        logging.info(
            f"--------------- SETUP: {self.test_suite_id}, {self.test_case_id} ----------
↪-----"
        )

    def test_run(self):
        logging.info(
            f"--------------- RUN: {self.test_suite_id}, {self.test_case_id} ------------
↪---"
        )

        logging.info("Power off all usb port")

        for port_number in range(4):
            acro_aux.set_port_disable(port_number)

        time.sleep(2)

        logging.info("Power on all usb ports")

        for port_number in range(4):
            acro_aux.set_port_enable(port_number)

        time.sleep(2)

        logging.info("Set current limit on all usb ports to 1000 mA")

        for port_number in range(4):
            acro_aux.set_port_current_limit(port_number, 1000, "mA")

        logging.info("Take measurements on all usb ports")
        for port_number in range(4):
            voltage = acro_aux.get_port_voltage(port_number, "V")
            current = acro_aux.get_port_current(port_number, "mA")
            current_limit = acro_aux.get_port_current_limit(port_number, "mA")
```

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```
            logging.info(
                f"Measured {voltage:.3f}V {current:.3f}mA "
                f"currentlimit {current_limit:.3f}mA on usb Port {port_number}"
            )

        logging.info("Set current limit on all usb ports to maximum -> 2500 mA")
        for port_number in range(4):
            current_limit = acro_aux.set_port_current_limit(port_number, 2500, "mA")

    def tearDown(self):
        """Hook method from unittest in order to execute code after test case run."""
        logging.info(
            f"--------------- TEARDOWN: {self.test_suite_id}, {self.test_case_id} -------
↪--------"
        )
```

## 5.2 Controlling an Instrument

The instrument-control command offers a way to interface with an arbitrary instrument, such as power supplies from different brands. The Standard Commands for Programmable Instruments (SCPI) protocol is used to control the desired instrument. This section aims to describe how to use instrument-control as an auxiliary for integration testing, and also how to interface directly with the instrument using the built-in command line interface (CLI).

### 5.2.1 Requirements

A successful pykiso installation as described in this chapter: *Install*

### 5.2.2 Integration Test Usage

The auxiliary functionalities can be used during integration tests.

Add Test file: See the dedicated section below: *Implementation of Instrument Tests*

Add Config File In your test configuration file, provide what is necessary to interface with the instrument:

- Chose between the VISASerial and the VISATcpip connector
- If you are using a serial interface, the *serial_port* must be provided in the connector configuration, and the *baud_rate* is optional.
- If you are using a tcpip interface, the *ip_address* must be provided in the connector configuration.
- Chose the InstrumentControlAuxiliary

---

**Note:** You cannot use the instrument-control auxiliary with a proxy.

---

- **The SCPI commands might be different or even not available depending on the instrument that you are using. If you prov**
  parameter and the instrument is recognized, the functions in the *lib_scpi* will automatically be adapted according to your instrument capabilities and specificities.
- If your instrument has more than one output channel, provide the one to use in *output_channel*.

Example of a test configuration file using instrument-control auxiliary:

Examples:

```yaml
# Connection to a local PSI 9000 T power supply from EA Elektro-Automatik GmbH & Co
auxiliaries:
  instr_aux:
    connectors:
      com: VISA
    config:
      instrument: "Elektro-Automatik"
    type: pykiso.lib.auxiliaries.instrument_control_auxiliary:InstrumentControlAuxiliary
connectors:
  VISA:
    config:
      serial_port: 5
    type: pykiso.lib.connectors.cc_visa:VISASerial
test_suite_list:
- suite_dir: test_suite_with_instruments
  test_filter_pattern: 'test*.py'
  test_suite_id: 1
```

```yaml
# Connection to the remote Rohde & Schwartz power supply
auxiliaries:
  instr_aux:
    connectors:
      com: Socket
    config:
      instrument: "Rohde&Schwarz"
      output_channel: 1
    type: pykiso.lib.auxiliaries.instrument_control_auxiliary:InstrumentControlAuxiliary
connectors:
  Socket:
    config:
      dest_ip: 'ENV{POWER_SUPPLY_IP}'
      dest_port: 3000
    type: pykiso.lib.connectors.cc_tcp_ip:CCTcpip
test_suite_list:
- suite_dir: test_suite_with_instruments
  test_filter_pattern: 'test*.py'
  test_suite_id: 1
```

### Implementation of Instrument Tests

Using the instrument auxiliary (*instr_aux*) inside integration tests is useful to control the instrument (e.g. a power supply) the device under test is connected to. There are two different ways to interface with an instrument:

1. The first option is to use the *read*, *write*, and *query* commands to directly send SCPI commands to the instrument. If you use this method, refer to your instrument's datasheet to get the appropriate SCPI commands.
2. The other option is to use the built-in functionalities from the library to communicate with the instrument. For that, use the *lib_scpi* attribute of your *instru_aux* auxiliary.

You can then send *read*, *write* and *query* (*write* + *read*) requests to the instrument.

For example: #. To query the identification data of your instrument, you can use *instr_aux.query("*IDN?")* #. To set the voltage target value to 12V, you can use *instr_aux.write("SOUR:VOLT 12.0")*

Some helper commands have already been implemented to simplify the testing. For example, using helpers: #. To query the identification data of your instrument: *instr_aux.helpers.get_identification()*. #. To set the voltage target value to 12V: *instr_aux.helpers.set_target_voltage(12.0)*

**Notice that the SCPI command can be different depending on the instrument. For some instrument, some features are also unav**
Some instruments are already registered. If you specify the name of the instrument that you are using in the YAML file, the helpers function will select and use the SCPI commands that are appropriate or tell you if the command is not available.

**When setting a parameter on the instrument, it is possible to use a validation procedure to make sure that the parameter was su**
The validation procedure consists in sending a query immediately after sending the write command, the answer of the query will then tell if the write command was successful or not. For instance, in order to enable the output on the currently selected channel of the instrument, we can use *instr_aux.write("OUTP ON")*, or, using the validation procedure, *instr_aux.write("OUTP ON", ("OUTP?", "ON"))*. Notice that the validation parameter is a tuple of the form ('query to send to check the writing operation', 'expected answer') When the expected answer is a number, please use the "VALUE{}" tag. For instance, you can use *instr_aux.write("SOUR:VOLT 12.5", ("SOUR:VOLT?", "VALUE{12.5}"))*. That way, it does not matter if the instrument returns *12.50*, *12.500* or *1.25000E1*, the writing operation will be considered successful. Also, if you are not sure what your instrument will respond to the validation, you can compare that output to a list of string, instead on a single string. For example, you can use *instr_aux.write("OUTP ON", ("OUTP?", ["ON", "1"]))*. The *VALUE* should not passed inside a list. This validation procedure is used in all the helper functions (except reset)

The following integration test file will provide some examples:

**instrument_test.py**:

```
import logging
import time

import pykiso
from pykiso.auxiliaries import instr_aux


@pykiso.define_test_parameters(suite_id=1, case_id=1, aux_list=[instr_aux])
class TestWithPowerSupply(pykiso.BasicTest):
    def setUp(self):
        """Hook method from unittest in order to execute code before test case run."""
        logging.info(
            f"--------------- SETUP: {self.test_suite_id}, {self.test_case_id} ----------
↪-----"
        )

    def test_run(self):
        logging.info(
            f"--------------- RUN: {self.test_suite_id}, {self.test_case_id} ------------
↪---"
        )

        logging.info("---General information about the instrument:")
        # using the auxiliary's 'query' method
        logging.info(f"Info: {instr_aux.query('*IDN?')}")
        # using the commands from the library
        logging.info(f"Status byte: {instr_aux.helpers.get_status_byte()}")
```

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```
        logging.info(f"Errors: {instr_aux.helpers.get_all_errors()}")
        logging.info(f"Perform a self-test: {instr_aux.helpers.self_test()}")

        # Remote Control
        logging.info("Remote control")
        instr_aux.helpers.set_remote_control_off()
        instr_aux.helpers.set_remote_control_on()

        # Nominal values
        logging.info("---Nominal values:")
        logging.info(f"Nominal voltage: {instr_aux.helpers.get_nominal_voltage()}")
        logging.info(f"Nominal current: {instr_aux.helpers.get_nominal_current()}")
        logging.info(f"Nominal power: {instr_aux.helpers.get_nominal_power()}")

        # Current values
        logging.info("---Measuring current values:")
        logging.info(f"Measured voltage: {instr_aux.helpers.measure_voltage()}")
        logging.info(f"Measured current: {instr_aux.helpers.measure_current()}")
        logging.info(f"Measured power: {instr_aux.helpers.measure_power()}")

        # Limit values
        logging.info("---Limit values:")
        logging.info(f"Voltage limit low: {instr_aux.helpers.get_voltage_limit_low()}")
        logging.info(
            f"Voltage limit high: {instr_aux.helpers.get_voltage_limit_high()}"
        )
        logging.info(f"Current limit low: {instr_aux.helpers.get_current_limit_low()}")
        logging.info(
            f"Current limit high: {instr_aux.helpers.get_current_limit_high()}"
        )
        logging.info(f"Power limit high: {instr_aux.helpers.get_power_limit_high()}")

        # Test scenario
        logging.info("Scenario: apply 36V on the selected channel for 1s")
        dc_voltage = 36.0  # V
        dc_current = 1.0  # A
        logging.info(
            f"Set voltage to {dc_voltage}V: {instr_aux.helpers.set_target_voltage(dc_
↪voltage)}"
        )
        logging.info(
            f"Set voltage to {dc_current}V: {instr_aux.helpers.set_target_current(dc_
↪current)}"
        )
        logging.info(f"Switch on output: {instr_aux.helpers.enable_output()}")
        logging.info("sleeping for 1s")
        time.sleep(0.5)
        logging.info(f"measured voltage: {instr_aux.helpers.measure_voltage()}")
        logging.info(f"measured current: {instr_aux.helpers.measure_current()}")
        time.sleep(0.5)
        logging.info(f"Switch off output: {instr_aux.helpers.disable_output()}")
```

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```
        logging.info(
            f"Trying to set an impossible value (1000V) {instr_aux.helpers.set_target_
↪voltage(1000)}"
        )

    def tearDown(self):
        """Hook method from unittest in order to execute code after test case run."""
        logging.info(
            f"--------------- TEARDOWN: {self.test_suite_id}, {self.test_case_id} -------
↪--------"
        )
```

### 5.2.3 Command Line Usage

The auxiliary functionalities can also be used from a command line interface (CLI). This section provides a basic overview of exemplary use cases processed through the CLI, as well as a general overview of all possible commands.

#### Connection to the instrument

Every tine that the instrument-control CLI will be called, a connection to the instrument will be opened. Then, some actions and/or measurement will be done, and the connection will finally be closed. As a consequence, you should always give the necessary options to be able to connect to the instrument.

- Chose an interface (*VISA_SERIAL*, *VISA_TCPIP*, or *SOCKET_TCPIP*). Use *-i* or *–interface*. This option is mandatory.
- **Use the *-p/–port*, the *-ip/–ip-address*. Several option are available for the different interfaces:**
  - VISA_TCPIP: you must provide an ip address, the port is optional.
  - VISA_SERIAL: you must indicate the serial port to use.
  - SOCKET_TCPIP: you must have to set the ip address and a port.
- You can add a *-b/–baud-rate* option if you chose a SERIAL interface
- You can add a *–name* option to indicate that you are using a specific instrument. If this instrument is registered, the SCPI command specific to this instrument will be used instead of the default commands. For instance, selecting the output channel is not possible for Elektro-Automatik instruments because they only have one. The Rhode & Schwarz on the other hand does, so the corresponding commands are available.
- You can add a *–log-level* option to indicate the logging verbosity.

#### Performing measurement and setting values

You can then use other options to perform measurements and set values on your instrument. For that use the following options.

Flag options:

- Get the instrument identification information: *–identification*
- Resets the instrument: *–reset*
- Get the instrument status byte: *–status-byte*

- Get the errors currently stored in the instrument: *–all-errors*
- Performs a self test of the instrument: *–self-test*
- Get the instrument voltage nominal value: *–voltage-nominal*
- Get the instrument current nominal value: *–current-nominal*
- Get the instrument power nominal value: *–power-nominal*
- Measures voltage on the instrument: *–voltage-measure*
- Measures current on the instrument: *–current-measure*
- Measures power on the instrument: *–power-measure*

Options with values (specify a floating value for the parameter that you want to set on the instrument. If you want to get the value currently set on the instrument, write *get* instead of the numeric value)

- Instrument's output channel: *–output-channel*
- Instrument's voltage target value: *–voltage-target*
- Instrument's current target value: *–current-target*
- Instrument's power target value: *–power-target*
- Instrument's voltage lower limit: *–voltage-limit-low*
- Instrument's voltage higher limit: *–voltage-limit-high*
- Instrument's current lower limit: *–current-limit-low*
- Instrument's current higher limit: *–current-limit-high*
- Instrument's power higher limit: *–power-limit-high*

Other options with values:

- Instrument's remote control: *–remote-control*. Use *get* to get the remote control state, *on* to enable and *off* to disable the remote control on the instrument. - Instrument's output mode (output channel enable/disabled): *–output-mode*. Use *get* to get the remote control state, *enable* to enable and *disable* to disable the output of the currently selected channel of the instrument.

You can also send custom write and query commands:

- Send custom query command: *–query*
- Send custom write command: *–write*

### Usage Examples

For all following examples, assume that we are connecting to a serial instrument on port COM4.

Requesting basic information from the instrument:

```
instrument-control -i VISA_SERIAL -p 4 --identification
```

Request basic information from the instrument via the SOCKET_TCPIP interface:

```
instrument-control -i SOCKET_TCPIP -ip 10.10.10.10 -p 5025 --identification
```

Reset the device with VISA_TCPIP interface and the address 10.10.10.10:

```
instrument-control -i VISA_TCPIP -ip 10.10.10.10 --reset
```

Also reset the instrument, but use the VISA_SERIAL on port 4 and set the baud rate to 9600:

```
instrument-control -i VISA_SERIAL -p 4 --baud-rate 9600 --reset
```

Get the currently selected output channel from a Rohde & Schwarz device

```
instrument-control -i SOCKET_TCPIP -ip 10.10.10.10 -p 5025 --name "Rohde&Schwarz" --
↪output-channel get
```

Set the output channel from a Rohde & Schwarz device to channel 3

```
instrument-control -i SOCKET_TCPIP -ip 10.10.10.10 -p 5025 --name "Rohde&Schwarz" --
↪output-channel 3
```

Read the target value for the current

```
instrument-control -i VISA_SERIAL -p 4 --current-target
```

Set the current target to 1.0 Ampere

```
instrument-control -i VISA_SERIAL -p 4 --current-target 1.0
```

Enable remote control on the instrument

```
instrument-control -i VISA_SERIAL -p 4 --remote-control ON
```

Set the voltage to 35 Volts and then enable the output:

```
instrument-control -i VISA_SERIAL -p 4 --voltage-target 35.0 --output-mode ENABLE
```

Get the instrument's identification information by sending custom a query command:

```
instrument-control -i VISA_SERIAL -p 4 --query *IDN?
```

Reset the instrument by sending a custom write command:

```
instrument-control -i VISA_SERIAL -p 4 --write *RST
```

Example interacting with a remote instrument:

Measuring the current voltage on channel 3:

```
instrument-control -i SOCKET_TCPIP -ip 10.10.10.10 -p 5025 --output-channel 3 --voltage-
↪measure
```

#### Interactive mode

The CLI includes an interactive mode. You can use it by adding the *–interactive* flag when you call the instrument-control CLI. Once you are inside this interactive mode, you can send commands one after the other. You may use all the available commands (you can remove the double dash).

Example:

1. Enter interactive mode,
2. get the identification information,
3. query the currently selected output channel,
4. set the output-channel to 3,
5. apply 36V,
6. and then measure the voltage.

```
instrument-control -i VISA_SERIAL -p 4 --identification get --interactive
output-channel
output-channel 3
remote-control on
voltage-target 36
output-mode enable
voltage-measure
exit
```

#### General Command Overview

```
instrument-control --help
```

## 5.3 Passively record a channel

The record auxiliary can be used to utilize the logging mechanism from a connector. For example the realtime trace from the segger jlink can be recorded during a test run. The record auxiliary can also be used to save the log into a chosen file. It is also able to search for some specific message or regular expression (regex) into the current string or into a specified file/folder.

### 5.3.1 Usage Examples

To use the auxiliary in your test scripts the auxiliary must be properly defined in the config yaml. Example:

```
auxiliaries:
  record_aux:
    connectors:
      com: rtt_channel
    config:
      # When is_active is set, it actively polls the connector. It demands if
      # the used connector needs to be polled actively.
      is_active: False # False because rtt_channel has its own receive thread
```

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```
    type: pykiso.lib.auxiliaries.record_auxiliary:RecordAuxiliary

connectors:
  rtt_channel:
    config:
      chip_name: "STM12345678"
      speed: 4000
      block_address: 0x12345678
      verbose: True
      tx_buffer_idx: 1
      rx_buffer_idx: 1
      # Path relative to this yaml where the RTT logs should be written to.
      # Creates a file named rtt.log
      rtt_log_path: ./
      # RTT channel from where the RTT logs should be read
      rtt_log_buffer_idx: 0
      # Manage RTT log CPU impact by setting logger speed. eg: 100% CPU load
      # default: 1000 lines/s
      rtt_log_speed: null
    type: pykiso.lib.connectors.cc_rtt_segger:CCRttSegger

test_suite_list:
- suite_dir: test_record
  test_filter_pattern: '*.py'
  test_suite_id: 1
```

```
auxiliaries:
  record_aux:
    connectors:
      com: example_channel
    config:
      com: CChannel
      is_active: True
      timeout: 0
      log_folder_path: "examples/test_record"
    type: pykiso.lib.auxiliaries.record_auxiliary:RecordAuxiliary

connectors:
  example_channel:
    config: null
    type: pykiso.lib.connectors.cc_raw_loopback:CCLoopback

test_suite_list:
- suite_dir: test_record
  test_filter_pattern: test_recorder_example.py
  test_suite_id: 1
```

Below find a example for the usage in a test script. It is only necessary to import record auxiliary.

```
from pykiso.auxiliaries import record_aux
```

Example test script:

```
##########################################################################
# Copyright (c) 2010-2022 Robert Bosch GmbH
# This program and the accompanying materials are made available under the
# terms of the Eclipse Public License 2.0 which is available at
# http://www.eclipse.org/legal/epl-2.0.
#
# SPDX-License-Identifier: EPL-2.0
##########################################################################

"""
Record auxiliary test
*********************

:module: test_record

:synopsis: Example test that shows how to record a connector

.. currentmodule:: test_record

"""

import logging
import time

import pykiso

# !!! IMPORTANT !!!
# To start recording the channel which are specified in the yaml file,
# the record_aux must be first imported here.
# The channel recording will then run automatically in the background.
from pykiso.auxiliaries import record_aux


@pykiso.define_test_parameters(suite_id=1, case_id=1, aux_list=[])
class TestWithPowerSupply(pykiso.BasicTest):
    def setUp(self):
        """Hook method from unittest in order to execute code before test case run."""
        logging.info(
            f"--------------- SETUP: {self.test_suite_id}, {self.test_case_id} ----------
↪----"
        )

    def test_run(self):
        logging.info(
            f"--------------- RUN: {self.test_suite_id}, {self.test_case_id} ------------
↪----"
        )

        logging.info(
            "Sleep 5 Seconds. Record specified channel from .yaml in the background."
        )
        time.sleep(5)
```

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```
    def tearDown(self):
        """Hook method from unittest in order to execute code after test case run."""
        logging.info(
            f"--------------- TEARDOWN: {self.test_suite_id}, {self.test_case_id} -------
↪----"
        )
```

```
##############################################################################
# Copyright (c) 2010-2022 Robert Bosch GmbH
# This program and the accompanying materials are made available under the
# terms of the Eclipse Public License 2.0 which is available at
# http://www.eclipse.org/legal/epl-2.0.
#
# SPDX-License-Identifier: EPL-2.0
##############################################################################

"""
Record auxiliary test
*********************

:module: test_record

:synopsis: Example test that shows how to record a connector

.. currentmodule:: test_record

"""

import logging
import time

import pykiso
from pykiso.auxiliaries import record_aux

logging = logging.getLogger(__name__)


@pykiso.define_test_parameters(suite_id=1, case_id=1, aux_list=[])
class TestWithPowerSupply(pykiso.BasicTest):
    def generate_new_log(self, msg: bytes):
        return record_aux.channel._cc_send(msg)

    def setUp(self):
        """Hook method from unittest in order to execute code before test case run."""
        logging.info(
            f"--------------- SETUP: {self.test_suite_id}, {self.test_case_id} ----------
↪----"
        )

    def test_run(self):
        """"""
        logging.info(
```

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```
            f"--------------- RUN: {self.test_suite_id}, {self.test_case_id} ------------
↪----"
        )
        header = record_aux.new_log()
        self.assertEqual(header, "Received data :")

        self.generate_new_log(msg=b"log1")
        time.sleep(1)
        new_log = record_aux.new_log()
        self.assertEqual(new_log, "\nlog1")
        logging.info(new_log)

        self.generate_new_log(msg=b"log2")
        time.sleep(1)
        new_log = record_aux.new_log()
        self.assertEqual(new_log, "\nlog2")
        logging.info(new_log)

        logging.info(record_aux.get_data())

        # search regex
        logging.info(record_aux.search_regex_current_string(regex=r"log\d"))

        # clear data and check
        record_aux.clear_buffer()
        logging.info(record_aux.get_data())

        # create a file where it write recorded data. as log is empty, will not return␣
↪any file
        record_aux.dump_to_file(filename="record_example.txt")

        record_aux.stop_recording()

        logging.info("Sleep 1 Seconds to do something else with the channel.")
        time.sleep(1)

        record_aux.start_recording()
        time.sleep(1)  # Time for the channel to get opened
        header = record_aux.new_log()
        self.assertEqual(header, "Received data :")

        self.generate_new_log(msg=b"log3")
        time.sleep(1)
        new_log = record_aux.new_log()
        self.assertEqual(new_log, "\nlog3")
        logging.info(new_log)

    def tearDown(self):
        """Hook method from unittest in order to execute code after test case run."""
        logging.info(
            f"--------------- TEARDOWN: {self.test_suite_id}, {self.test_case_id} -------
↪----"
```

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```
        )
```

## 5.4 Using UDS protocol

UdsAuxiliary class (*pykiso.lib.auxiliaries.udsaux.uds_auxiliary.UdsAuxiliary*) contained in uds_auxiliary.py is the main interface between user and all the behind implemented logic. This class defines usable keywords(methods) for scripters in order to send uds requests to the device under test (raw or configurable)...

### 5.4.1 Configuration

To configure the UDS auxiliary 3 parameters are mandatory :

- odx_file_path: path to the odx formatted ecu diagnostic definition file.

---

**Note:** More information about yaml test configuration creation are available under Test Integration Framework project documentation.

---

Find below a complete configuration example :

```yaml
auxiliaries:
  uds_aux:
    connectors:
        com: can_channel
    config:
      # you can specify your odx file by using odx_file_path parameter
      # and instead of using send_uds_raw method use the send_uds_config
      # for a more human readable command
      odx_file_path: null
      request_id : 0x123
      response_id : 0x321
      # uds_layer parameter is not mandatory and by default the following
      # values will be applied:
      # transport_protocol -> CAN
      # p2_can_client -> 5
      # p2_can_server -> 1
      uds_layer:
        transport_protocol: 'CAN'
        p2_can_client: 5
        p2_can_server: 1
      # tp_layer parameter is not mandatory and by default the following
      # values will be applied:
      # addressing_type -> NORMAL
      # n_sa -> 0xFF
      # n_ta -> 0xFF
      # n_ae -> 0xFF
      # m_type -> DIAGNOSTICS
      # discard_neg_resp -> False
      tp_layer:
        addressing_type: 'NORMAL'
```

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```
        n_sa: 0xFF
        n_ta: 0xFF
        n_ae: 0xFF
        m_type: 'DIAGNOSTICS'
        discard_neg_resp: False
    type: pykiso.lib.auxiliaries.udsaux.uds_auxiliary:UdsAuxiliary
connectors:
  can_channel:
    config:
      interface : 'pcan'
      channel: 'PCAN_USBBUS1'
      state: 'ACTIVE'
    type: pykiso.lib.connectors.cc_pcan_can:CCPCanCan
test_suite_list:
- suite_dir: test_uds
  test_filter_pattern: 'test_raw_uds*.py'
  test_suite_id: 1
```

### 5.4.2 Send UDS Raw Request

Send UDS request as list of raw bytes.

The method send_uds_raw(`pykiso.lib.auxiliaries.udsaux.UdsAuxiliary.send_uds_raw()`) takes one mandatory parameter msg_to_send and one optional : timeout_in_s

The parameter msg_to_send is simply the UDS request payload which is a list of bytes.

The optional parameter timeout_in_s (by default fixed to 5 seconds) simply represent the maximum amount of time in second to wait for a response from the device under test. If this timeout is reached, the uds-auxiliary stop to acquire and log an error.

The method send_uds_raw method returns a `UdsResponse` object, which is a subclass of UserList. UserList allow to keep property of the list, meanwhile attributes can be set, for UdsResponse, defined attributes refer to the positivity of the response, and its NRC if negative.

```
class UdsResponse(UserList):
    NEGATIVE_RESPONSE_SID = 0x7F

    def __init__(self, response_data) -> None:
        super().__init__(response_data)
        self.is_negative = False
        self.nrc = None
        if self.data and self.data[0] == self.NEGATIVE_RESPONSE_SID:
            self.is_negative = True
            self.nrc = NegativeResponseCode(self.data[2])
```

Here is an example:

```
import pykiso
from pykiso.auxiliaries import uds_aux
from collections import UserList
```

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```
@pykiso.define_test_parameters(suite_id=1, case_id=1, aux_list=[uds_aux])
class ExampleUdsTest(pykiso.BasicTest):
    def setUp(self):
        """Hook method from unittest in order to execute code before test case run.
        """
        pass

    def test_run(self):
        # Set extended session
        diag_session_response = uds_aux.send_uds_raw([0x10, 0x03])
        self.assertEqual(diag_session_response[:2], [0x50, 0x03])
        self.assertEqual(type(diag_session_response), UserList)
        self.assertFalse(diag_session_response.is_negative)

    def tearDown(self):
        """Hook method from unittest in order to execute code after test case run.
        """
        pass
```

### 5.4.3 Send UDS Config Request

Send UDS request as a configurable data dictionary. This method can be more practical for UDS requests with long payloads and a multitude of parameters.

The method send_uds_config(*pykiso.lib.auxiliaries.udsaux.uds_auxiliary.UdsAuxiliary.send_uds_config()*) takes one mandatory parameter msg_to_send and an optional one timeout_in_s.

The parameter msg_to_send is the UDS request defined as a configurable dictionary that always respects the below defined template:

**Note:** this feature is only available if a valid ODX file is given at auxiliary configuration level

```
req = {
    'service': %SERVICE_ID%,
    'data': %DATA%
    }
```

SERVICE_ID -> SID (Service Identifier) of the UDS request either defined as a byte or the corresponding enum label:

```
class IsoServices(IntEnum):
    DiagnosticSessionControl = 0x10
    EcuReset = 0x11
    SecurityAccess = 0x27
    CommunicationControl = 0x28
    TesterPresent = 0x3E
    AccessTimingParameter = 0x83
    SecuredDataTransmission = 0x84
    ControlDTCSetting = 0x85
    ResponseOnEvent = 0x86
```

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```
    LinkControl = 0x87
    ReadDataByIdentifier = 0x22
    ReadMemoryByAddress = 0x23
    ReadScalingDataByIdentifier = 0x24
    ReadDataByPeriodicIdentifier = 0x2A
    DynamicallyDefineDataIdentifier = 0x2C
    WriteDataByIdentifier = 0x2E
    WriteMemoryByAddress = 0x3D
    ClearDiagnosticInformation = 0x14
    ReadDTCInformation = 0x19
    InputOutputControlByIdentifier = 0x2F
    RoutineControl = 0x31
    RequestDownload = 0x34
    RequestUpload = 0x35
    TransferData = 0x36
    RequestTransferExit = 0x37
```

DATA -> dictionary that contains the following keys:

- 'parameter': DID (Data Identifier) of the UDS request. (In most UDS services with DID)
- %param_n%: one or many keys that represent the parameters related to the service, those depend on ODX definition that is tested.

See some examples of UDS requests below:

```
import pykiso
from pykiso.auxiliaries import uds_aux
from uds import IsoServices

@pykiso.define_test_parameters(suite_id=1, case_id=1, aux_list=[uds_aux])
class ExampleUdsTest(pykiso.BasicTest):
    def setUp(self):
        """Hook method from unittest in order to execute code before test case run.
        """
        pass

    def test_run(self):
            extendedSession_req = {
                "service": IsoServices.DiagnosticSessionControl,
                "data": {"parameter": "Extended Diagnostic Session"},
            }
            diag_session_response = uds_aux.send_uds_config(extendedSession_req)

    def tearDown(self):
        """Hook method from unittest in order to execute code after test case run.
        """
        pass
```

The optional parameter timeout_in_s (by default fixed to 6 seconds) simply represents the maximum amount of time in second to wait for a response from the device under test. If this timeout is reached, the uds-auxiliary stops to acquire and log an error.

If the corresponding response is received from entity under test, send_uds_config method returns it also as a preconfigured dictionary.
In case of a UDS positive response and no data to be returned, None is returned by the send_uds_config method.
In case of a UDS negative response, a dictionary with the key 'NRC' is returned and the NRC value.
Optionally, 'NRC_Label' may be returned if it is defined in ODX for the called service, containing the uds negative response description.

### 5.4.4 UDS Reset functions

|Reset might be integrated in different tests. |The methods : - soft_rest(*pykiso.lib.auxiliaries.udsaux.uds_auxiliary.UdsAuxiliary.soft_reset()*) | - hard_reset(*pykiso.lib.auxiliaries.udsaux.uds_auxiliary.UdsAuxiliary.hard_reset()*) | - force_ecu_reset(udsaux.uds_auxiliary.UdsAuxiliary.force_ecu_reset()) |do not take any argument, and regarding the config (with our without odx file) will send either raw message, or |uds config (except for the key_off_on methods, but can remain acceptable for odx uds config)

### 5.4.5 UDS check functions

|Check functions might be integrated in different tests. |The methods : - check_raw_response_negative(*pykiso.lib.auxiliaries.udsaux.uds_auxiliary.UdsAuxiliary.check_raw_response_negative()*) | - check_raw_response_positive(*pykiso.lib.auxiliaries.udsaux.uds_auxiliary.UdsAuxiliary.check_raw_response_positive()*) |The methods take one mandatory argument resp. |The parameter rest is the response as a userlist object

### 5.4.6 UDS read & write data

|Read data(udsaux.uds_auxiliary.UdsAuxiliary.read_data()) and write(udsaux.uds_auxiliary.UdsAuxiliary.write_data()) |are two helper API that use send_uds_config with specific ISO services (udsaux.uds_utils.UdsAuxiliary.read_data())

```
ReadDataByIdentifier = 0x22

WriteDataByIdentifier = 0x2E
```

|Using write_data takes two arguments : parameter, and value. |Parameter is simply a string that refer to the name of the data you want to modify, and value |is simply the value you want to assign to the chosen parameters |API must return None in case of positive response, and dictionary with NRC in it (for further information, |check in send_uds_config documentation). |Using this API is similar to do this :

```
req = {
    'service': IsoServices.WriteDataByIdentifier,
    'data': {'parameter': 'MyProduct', 'dataRecord': [('SuperProduct', '12345')]}
}

resp = uds_aux.send_uds_config(writeProductCode_req)
return resp
```

|In the same way, read_data takes one argument : parameter. |Parameter is a string that contain the name of the data that is to be read. API must return dictionary with either |data associated to the read parameter, or NRC.

### 5.4.7 UDS tester present sender

|In order for any diagnostic session to be kept open, a tester presence frame has to be sent every 5 seconds. |For this purpose, the tester present sender context manager can be used, it will send the tester |present frame at the period given, allowing you to keep the session open for more than 5 seconds.

```
# start sending tester present messages every 3 seconds until the context manager is␣
↪exited
with uds_aux.tester_present_sender(period=3):
    # Perform uds commands here
```

|It is also possible to start and stop the tester present sender manually with the methods |start_tester_present_sender and stop_tester_present_sender.

```
# start sending tester present messages every 1 seconds until the context manager is␣
↪exited
uds_aux.start_tester_present_sender(period=1)
# Perform uds commands here
uds_aux.stop_tester_present_sender()
```

|It is then possible to check if the tester present is active with the attribute is_tester_present

```
if uds_aux.is_tester_present:
    # Perform commands here
```

## 5.5 UDS protocol handling as a server

The *UdsServerAuxiliary* implements the Unified Diagnostic Services protocol on server side and therefore acts as an Electronic Control Unit communicating with a tester.

It allows the registration of callbacks through the helper class *UdsCallback* or simply by specifying the arguments of *register_callback()*, that are then triggered when the registered UDS request is received, allowing to respond with user-defined UDS messages.

### 5.5.1 Configuration

To configure the UDS server auxiliary 1 parameter is mandatory :

- `config_ini_path`: path to the UDS parameters configuration file (see format below).

It also accepts three optional parameters:

- **`request_id`: CAN identifier of the UDS responses send by the auxiliary** (overrides the one defined in the config.ini file)
- **`response_id`: CAN identifier of the UDS requests received by the auxiliary** (overrides the one defined in the config.ini file)
- `odx_file_path`: path to the ECU diagnostic definition file in ODX format

---

**Note:** the configuration through an ODX file is not supported yet.

---

Find below a complete configuration example :

```yaml
auxiliaries:
    uds_aux:
        connectors:
            com: can_channel
        config:
            odx_file_path: ./path/to/my/file.odx
            # For Vector Box, serial number and interface needs to be updated in config.
↪ini file
            # request and response id need to be configured in config.ini if not␣
↪specified
            # by the request_id and response_id parameters
            config_ini_path: ./test_uds/config.ini
            # override the CAN IDs specified in the config.ini file
            request_id: 0x123
            response_id: 0x321
        type: pykiso.lib.auxiliaries.udsaux.uds_server_auxiliary:UdsServerAuxiliary
connectors:
    can_channel:
        config:
        interface: 'pcan'
        channel: 'PCAN_USBBUS1'
        state: 'ACTIVE'
        type: pykiso.lib.connectors.cc_pcan_can:CCPCanCan
test_suite_list:
-   suite_dir: ./test_uds
    test_filter_pattern: 'test_uds_server.py'
    test_suite_id: 1
```

And for the config.ini file:

```ini
[can]
interface=peak
canfd=True
baudrate=500000
data_baudrate=2000000
defaultReqId=0xAC
defaultResId=0xDC

[uds]
transportProtocol=CAN
P2_CAN_Client=5
P2_CAN_Server=1

[canTp]
reqId=0xAC
resId=0xDC
addressingType=NORMAL
N_SA=0xFF
N_TA=0xFF
N_AE=0xFF
Mtype=DIAGNOSTICS
discardNegResp=False
```

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```
[virtual]
interfaceName=virtualInterface

[peak]
device=PCAN_USBBUS1
f_clock_mhz=80
nom_brp=2
nom_tseg1=63
nom_tseg2=16
nom_sjw=16
data_brp=4
data_tseg1=7
data_tseg2=2
data_sjw=2

[vector]
channel=1
appName=MyApp

[socketcan]
channel=can0
```

### 5.5.2 Configuring UDS callbacks

In order to configure callbacks to be triggered on a received request, the *register_callback()* needs to be called.

The available parameters for defining a callback are the following:

- **`request` (mandatory): the incoming UDS request on which the corresponding callback should be executed.** The request can be passed as an integer (e.g. `0x1003` or as a list of integers `[0x10, 0x03]`).
- **`response` (optional): the UDS response to send if the registered request is received.** Passed format is the same as for the request parameter.
- **`response_data` (optional): the UDS data to send with the response. If the response is specified** the data is simply appended to the response. This parameter can be passed as an integer or as bytes (e.g. `b"DATA"`).
- **`data_length` (optional): the expected length of the data to send within the response, as an integer.** This parameter in only taken into account if the `response_data` parameter is specified and applied zero-padding to the response if the data to send is expected to have a fixed length.
- **`callback` (optional): a user-defined callback function to execute. If this parameter is provided,** all others optional parameters are discarded. The callback function must admit 2 positional arguments: the request on which the callback function is executed and the *UdsServerAuxiliary* instance that registered the callback.

---

**Note:** If the `response` parameter is not specified, the response will be built based on the `request` parameter. For example, a request `0x10020304` will produce the corresponding response `0x50020304`.

---

In order to define and register callbacks for a test, two ways are made possible:

- **With the helper class *UdsCallback*** in order to define the callbacks, and register them later.
- **With the method *register_callback()*** in order to define and register a callback at the same time.

### Split definition and registration

The *UdsCallback* can be imported from directly from `pykiso.lib.udsaux` and allow an easy definition of callbacks that are common to multiple test cases.

It takes the same parameters as *register_callback()* but allows to define the callbacks in order to register them afterwards.

Pykiso also defined a callback subclass for the UDS data download functional unit that can be directly imported and re-used, or taken as a reference in order to implement other functional UDS units: *UdsDownloadCallback*.

Find below an example:

```
# helper objects to build callbacks can be imported from the pykiso lib
from pykiso.lib.auxiliaries.udsaux import UdsCallback, UdsDownloadCallback

# callbacks to register can then be built and stored in a list in order to be registered␣
↪in tests
UDS_CALLBACKS = [
    # Here the response could be left out
    # It would be automatically built based on the request
    UdsCallback(request=0x3E00, response=0x7E00),

    # The download functional unit is available as a pre-defined callback
    # It only requires the stmin parameter (minimum time between 2 consecutive frames,␣
↪here 10ms)
    # Others (RequestUpload, RequestFileTransfer) can be implemented based on it.
    UdsDownloadCallback(stmin=10),

    # define a callback for incoming read data by identifier request with identifier␣
↪[0x01, 0x02]
    # the response will be built by:
    # - creating the positive response corresponding to the request: 0x620102
    # - appending the passed response data b'DATA': 0x620102_44415451
    # - zero-padding the response data until the expected length is reached: 0x620102_
↪44415451_0000
    UdsCallback(request=0x220102, response_data=b'DATA', data_len=6)
]
```

Admitting that this code is added to a `uds_callback_definition.py` file at the same level as the test case, it can then be registered inside a test as follows:

```
import pykiso
from pykiso.auxiliaries import uds_aux

from uds_callback_definition import UDS_CALLBACKS

@pykiso.define_test_parameters(suite_id=1, case_id=1, aux_list=[uds_aux])
class ExampleUdsServerTest(pykiso.BasicTest):

    def setUp(self):
        """Register callbacks from an external file for the test."""

        for callback in UDS_CALLBACKS:
            uds_aux.register_callback(callback)
```

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```
    def test_run(self):
        """Actual test."""
        ...

    def tearDown(self):
        """Unregister all callbacks from the external file."""
        for callback in UDS_CALLBACKS:
            uds_aux.register_callback(callback)
```

### In-test definition and registration

The method :py:meth:~pykiso.lib.auxiliaries.udsaux.uds_server_auxiliary.UdsServerAuxiliary.register_callback can be used inside a test case to define and register a callback with one line.

It admits the same parameters as :py:class:~pykiso.lib.auxiliaries.udsaux.common.uds_callback.UdsCallback and builds instances of it in the background.

Find below an example showing its usage, along with a custom callback function definition:

```
import typing

import pykiso
from pykiso.auxiliaries import uds_aux

# only used for type-hinting the custom callback
from pykiso.lib.auxiliaries.udsaux import UdsServerAuxiliary

def custom_callback(ecu_reset_request: typing.List[int], aux: UdsServerAuxiliary) ->␣
↪None:
    """Custom callback example for an ECU reset request.

    This simulates a pending response from the server before sending the
    corresponding positive response.

    :param ecu_reset_request: received ECU reset request from the client.
    :param aux: current UdsServerAuxiliary instance used in test.
    """
    for _ in range(4):
        aux.send_response([0x7F, 0x78])
        time.sleep(0.1)
    aux.send_response([0x51, 0x01])


@pykiso.define_test_parameters(suite_id=1, case_id=1, aux_list=[uds_aux])
class ExampleUdsServerTest(pykiso.BasicTest):

    def setUp(self):
        """Register various callbacks for the test."""
        # handle extended diagnostics session request
        # respond to an incoming request [0x10, 0x03] with [0x50, 0x03, 0x12, 0x34]
        uds_aux.register_callback(request=0x1003, response=0x50031234)
```

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```
        # handle incoming read data by identifier request with identifier [0x01, 0x02]
        # the response will be built by:
        # - creating the positive response corresponding to the request: 0x620102
        # - appending the passed response data b'DATA': 0x620102_44415451
        # - zero-padding the response data until the expected length is reached:␣
↪0x620102_44415451_0000
        uds_aux.register_callback(request=0x220102, response_data=b'DATA', data_length=6)

        # register the custom callback defined above
        uds_aux.register_callback(request=0x1101, callback=custom_callback)

    def test_run(self):
        """Actual test."""
        ...

    def tearDown(self):
        """Unregister all callbacks registered by the auxiliary."""

        for callback in uds_aux.callbacks:
            uds_aux.unregister_callback(callback)
```

### 5.5.3 Accessing UDS callbacks

Once registered, callbacks can be accessed inside a test via the *callbacks* attribute. This attribute is a dictionary linking the registered request as an **uppercase** hexadecimal string (e.g. `"0x2E0102"`) to the corresponding registered callback.

Accessing a callback can be useful for verifying if a callback was called at some point. Based on the test snippets above, the following complete test example aims to show this feature and provided an overview of all previously described features:

```
import typing

import pykiso
from pykiso.auxiliaries import uds_aux

# only used for type-hinting the custom callback
from pykiso.lib.auxiliaries.udsaux import UdsServerAuxiliary

from uds_callback_definition import UDS_CALLBACKS

def custom_callback(ecu_reset_request: typing.List[int], aux: UdsServerAuxiliary) ->␣
↪None:
    """Custom callback example for an ECU reset request.

    This simulates a pending response from the server before sending the
    corresponding positive response.

    :param ecu_reset_request: received ECU reset request from the client.
    :param aux: current UdsServerAuxiliary instance used in test.
```

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```
    """
    for _ in range(4):
        aux.send_response([0x7F, 0x78])
        time.sleep(0.1)
    aux.send_response([0x51, 0x01])


@pykiso.define_test_parameters(suite_id=1, case_id=1, aux_list=[uds_aux])
class ExampleUdsServerTest(pykiso.BasicTest):

    def setUp(self):
        """Register various callbacks for the test."""
        # register external pre-defined callbacks
        for callback in UDS_CALLBACKS:
            uds_aux.register_callback(callback)

        # handle extended diagnostics session request [0x10, 0x03]
        uds_aux.register_callback(request=0x1003, response=0x50031234)

        # handle incoming read data by identifier request with identifier [0x01, 0x02]
        uds_aux.register_callback(request=0x220102, response_data=b'DATA', data_length=6)

    def test_run(self):
        """Actual test. Simply wait a bit and expect the registered request to be␣
↪received
        (and the corresponding response to be sent to the client).
        """
        logging.info(
            f"--------------- RUN: {self.test_suite_id}, {self.test_case_id} ------------
↪---"
        )
        time.sleep(10)
        # access the previously registered callback
        extended_diag_session_callback = uds_aux.callbacks["0x1003"]
        self.assertGreater(
            extended_diag_session_callback.call_count,
            0,
            "Expected UDS request was not sent by the client after 10s",
        )

    def tearDown(self):
        """Unregister all callbacks registered by the auxiliary."""

        for callback in uds_aux.callbacks:
            uds_aux.unregister_callback(callback)
```

### 5.5.4 Modify the waiting time

Sending a huge amount of bytes over UDS can take some time and to avoid extra waiting time, users can modify the waiting time between two isotp packets of 4096 bytes.

It can be achieved using the public attribute from uds server auxiliary “tp_waiting_time”.

CHAPTER

SIX

# API DOCUMENTATION

## 6.1 Test Cases

### 6.1.1 Generic Test

**module** test_case

**synopsis** Basic extensible implementation of a TestCase, and of a Remote

TestCase for Message Protocol / TestApp usage.

**Note:** TODO later on will inherit from a metaclass to get the id parameters

**class** pykiso.test_coordinator.test_case.**BasicTest**(*test_suite_id*, *test_case_id*, *aux_list*, *setup_timeout*, *run_timeout*, *teardown_timeout*, *test_ids*, *tag*, *args*, *kwargs*)

Base for test-cases.

Initialize generic test-case.

**Parameters**

- **test_suite_id** (int) – test suite identification number
- **test_case_id** (int) – test case identification number
- **aux_list** (Optional[List[*AuxiliaryInterface*]]) – list of used auxiliaries
- **setup_timeout** (Optional[int]) – maximum time (in seconds) used to wait for a report during setup execution
- **run_timeout** (Optional[int]) – maximum time (in seconds) used to wait for a report during test_run execution
- **teardown_timeout** (Optional[int]) – the maximum time (in seconds) used to wait for a report during teardown execution
- **test_ids** (Optional[dict]) – jama references to get the coverage eg: {"Component1": ["Req1", "Req2"], "Component2": ["Req3"]}
- **tag** (Optional[Dict[str, List[str]]]) – dictionary containing lists of variants and/or test levels when only a subset of tests needs to be executed

**cleanup_and_skip**(*aux*, *info_to_print*)

Cleanup auxiliary and log reasons.

**Parameters**

- **aux** (*AuxiliaryInterface*) – corresponding auxiliary to abort
- **info_to_print** (str) – A message you want to print while cleaning up the test

**Return type** None

**setUp**()
Startup hook method to execute code before each test method.

**Return type** None

**classmethod setUpClass**()
A class method called before tests in an individual class are run.

This implementation is only mandatory to enable logging in junit report. The logging configuration has to be call inside test runner run, otherwise stdout is never caught.

**Return type** None

**tearDown**()
Closure hook method to execute code after each test method.

**Return type** None

class pykiso.test_coordinator.test_case.**RemoteTest**(*test_suite_id*, *test_case_id*, *aux_list*, *setup_timeout*, *run_timeout*, *teardown_timeout*, *test_ids*, *tag*, *args*, *kwargs*)
Base test-cases for Message Protocol / TestApp usage.

Initialize TestApp test-case.

**Parameters**

- **test_suite_id** (int) – test suite identification number
- **test_case_id** (int) – test case identification number
- **aux_list** (Optional[List[*AuxiliaryInterface*]]) – list of used auxiliaries
- **setup_timeout** (Optional[int]) – maximum time (in seconds) used to wait for a report during setup execution
- **run_timeout** (Optional[int]) – maximum time (in seconds) used to wait for a report during test_run execution
- **teardown_timeout** (Optional[int]) – the maximum time (in seconds) used to wait for a report during teardown execution
- **test_ids** (Optional[dict]) – jama references to get the coverage eg: {"Component1": ["Req1", "Req2"], "Component2": ["Req3"]}
- **tag** (Optional[Dict[str, List[str]]]) – dictionary containing lists of variants and/or test levels when only a subset of tests needs to be executed

**setUp**()
Startup hook method to execute code before each test method.

**Return type** None

**tearDown**()
Closure hook method to execute code after each test method.

**Return type** None

**test_run**()
Hook method from unittest in order to execute test case.

**Return type** None

pykiso.test_coordinator.test_case.**define_test_parameters**(*suite_id=0*, *case_id=0*, *aux_list=None*, *setup_timeout=None*, *run_timeout=None*, *teardown_timeout=None*, *test_ids=None*, *tag=None*)

Decorator to fill out test parameters of the BasicTest and RemoteTest automatically.

pykiso.test_coordinator.test_case.**retry_test_case**(*max_try=2*, *rerun_setup=False*, *rerun_teardown=False*, *stability_test=False*)

Decorator: retry mechanism for testCase.

The aim is to cover the 2 following cases:

- Unstable test : get the test pass within the {max_try} attempt
- Stability test : run {max_try} time the test expecting no error

The **retry_test_case** comes with the possibility to re-run the setUp and tearDown methods automatically.

**Parameters**

- **max_try** (int) – maximum number of try to get the test pass.
- **rerun_setup** (bool) – call the "setUp" method of the test.
- **rerun_teardown** (bool) – call the "tearDown" method of the test.
- **stability_test** (bool) – run {max_try} time the test and raise an exception if an error occurs.

**Returns** None, a testCase is not supposed to return anything.

**Raises** **Exception** – if stability_test, the exception that occurred during the execution; if not stability_test, the exception that occurred at the last try.

## 6.2 Connectors

*pykiso* comes with some ready to use implementations of different connectors.

### 6.2.1 Included Connectors

#### Connector Interface

#### Interface Definition for Connectors, CChannels and Flasher

**module** connector

**synopsis** Interface for a channel

**class** pykiso.connector.**CChannel**(*processing=False*, ***kwargs*)

Abstract class for coordination channel.

Constructor.

**Parameters** **processing** – if multiprocessing object is used.

**abstract _cc_close**()

Close the channel.

**Return type** None

**abstract _cc_open()**
Open the channel.

**Return type** None

**abstract _cc_receive(*timeout*, *raw=False*)**
How to receive something from the channel.

**Parameters**

- **timeout** (float) – Time to wait in second for a message to be received
- **raw** (bool) – send raw message without further work (default: False)

**Return type** dict

**Returns** message.Message() - If one received / None - If not

**abstract _cc_send(*msg*, *raw=False*, ***kwargs*)**
Sends the message on the channel.

**Parameters**

- **msg** (Union[*Message*, bytes, str]) – Message to send out
- **raw** (bool) – send raw message without further work (default: False)
- **kwargs** – named arguments

**Return type** None

**cc_receive(*timeout=0.1*, *raw=False*)**
Read a thread-safe message on the channel and send an acknowledgement.

**Parameters**

- **timeout** (float) – time in second to wait for reading a message
- **raw** (bool) – should the message be returned as pykiso.Message or sent as it is

**Return type** dict

**Returns** the received message

**cc_send(*msg*, *raw=False*, ***kwargs*)**
Send a thread-safe message on the channel and wait for an acknowledgement.

**Parameters**

- **msg** (Union[*Message*, bytes, str]) – message to send
- **raw** (bool) – should the message be converted as pykiso.Message or sent as it is
- **kwargs** – named arguments

**Return type** None

**close()**
Close a thread-safe channel.

**Return type** None

**open()**
Open a thread-safe channel.

**Return type** None

class pykiso.connector.**Connector**(*name=None*)
Abstract interface for all connectors to inherit from.

Defines hooks for opening and closing the connector and also defines a contextmanager interface.

Constructor.

**Parameters** **name** (Optional[str]) – alias for the connector, used for repr and logging.

**abstract close**()
Close the connector, freeing resources.

**abstract open**()
Initialise the Connector.

class pykiso.connector.**Flasher**(*binary=None*, ***kwargs*)
Interface for devices that can flash firmware on our targets.

Constructor.

**Parameters** **binary** (Union[str, Path, None]) – binary firmware file

**Raises**

- **ValueError** – if binary doesn't exist or is not a file
- **TypeError** – if given binary is None

**abstract flash**()
Flash firmware on the target.

### cc_example

### Virtual Communication Channel for tests

**module** cc_example

class pykiso.lib.connectors.cc_example.**CCExample**(*name=None*, ***kwargs*)
Only use for development purpose.

This channel simply handle basic TestApp response mechanism.

Initialize attributes.

**Parameters** **name** (Optional[str]) – name of the communication channel

**_cc_close**()
Close the channel.

**Return type** None

**_cc_open**()
Open the channel.

**Return type** None

**_cc_receive**(*timeout=0.1*, *raw=False*)
Reads from the channel - decorator usage for test.

**Parameters**

- **timeout** (float) – not use
- **raw** (bool) – if raw is false serialize it using Message serialize.

**Raises** **NotImplementedError** – receiving raw bytes is not supported.

**Return type** Dict[str, Optional[*Message*]]

**Returns** Message if successful, otherwise None

**_cc_send**(*msg*, *raw=False*)
Sends the message on the channel.

**Parameters**

- **msg** (*Message*) – message to send, should be Message type like.
- **raw** (bool) – if raw is false serialize it using Message serialize.

**Raises** **NotImplementedError** – sending raw bytes is not supported.

**Return type** None

### cc_fdx_lauterbach

### Communication Channel Via lauterbach

**module** cc_fdx_lauterbach

**synopsis** CChannel implementation for lauterbach(FDX)

**class** pykiso.lib.connectors.cc_fdx_lauterbach.**CCFdxLauterbach**(*t32_exc_path=None*, *t32_config=None*, *t32_main_script_path=None*, *t32_reset_script_path=None*, *t32_fdx_clr_buf_script_path=None*, *t32_in_test_reset_script_path=None*, *t32_api_path=None*, *port=None*, *node='localhost'*, *packlen='1024'*, *device=1*, ***kwargs*)

Lauterbach connector using the FDX protocol.

Constructor: initialize attributes with configuration data.

**Parameters**

- **t32_exc_path** (Optional[str]) – full path of Trace32 app to execute
- **t32_config** (Optional[str]) – full path of Trace32 configuration file
- **t32_main_script_path** (Optional[str]) – full path to the main cmm script to execute
- **t32_reset_script_path** (Optional[str]) – full path to the reset cmm script to execute
- **t32_fdx_clr_buf_script_path** (Optional[str]) – full path to the FDX reset cmm script to execute
- **t32_in_test_reset_script_path** (Optional[str]) – full path to the board reset cmm script to execute
- **t32_api_path** (Optional[str]) – full path of remote api
- **port** (Optional[str]) – port number used for UDP communication
- **node** (str) – node name (default localhost)
- **packlen** (str) – data pack length for UDP communication (default 1024)

- **device** (int) – configure device number given by Trace32 (default 1)

_cc_close()
Close FDX connection, UDP socket and shut down Trace32 App.

**Return type** None

_cc_open()
Load the Trace32 library, open the application and open the FDX channels (in/out).

**Return type** bool

**Returns** True if Trace32 is correctly open otherwise False

_cc_receive(*timeout=0.1*, *raw=False*)
Receive message using the FDX channel.

**Parameters** **raw** (bool) – boolean precising the message type

**Return type** Dict[str, Union[bytes, str, None]]

**Returns** message

_cc_send(*msg*, *raw=False*)
Sends a message using FDX channel.

**Parameters**

- **msg** (*Message*) – message
- **raw** (bool) – boolean precising the message type (encoded or not)

**Return type** int

**Returns** poll length

load_script(*script_path*)
Load a cmm script.

**Parameters** **script_path** (str) – cmm file path

**Returns** error status

reset_board()
Executes the board reset.

**Return type** None

start()
Override clicking on "go" in the Trace32 application.

The channel must have been successfully opened (Trace32 application opened and script loaded).

**Return type** None

class pykiso.lib.connectors.cc_fdx_lauterbach.**PracticeState**(*value*)
Available state for any scripts loaded into TRACE32.

### cc_mp_proxy

### Multiprocessing Proxy Channel

**module** cc_mp_proxy

**synopsis** concrete implementation of a multiprocessing proxy channel

CCProxy channel was created, in order to enable the connection of multiple auxiliaries on one and only one CChannel. This CChannel has to be used with a so called proxy auxiliary.

**class** pykiso.lib.connectors.cc_mp_proxy.**CCMpProxy**(***kwargs*)

Multiprocessing Proxy CChannel for multi auxiliary usage.

Initialize attributes.

**_cc_close**()

Close proxy channel.

Due to usage of multiprocessing the queue_in and queue_out state doesn't have to change in order to ensure that ProxyAuxiliary works even if suspend or resume is called.

**Return type** None

**_cc_open**()

Open proxy channel.

Due to usage of multiprocessing the queue_in and queue_out state doesn't have to change in order to ensure that ProxyAuxiliary works even if suspend or resume is called.

**Return type** None

**_cc_receive**(*timeout=0.1*, *raw=False*)

Depopulate the queue out of the proxy connector.

**Parameters**

- **timeout** (float) – not used
- **raw** (bool) – not used

**Return type** Union[Dict[str, Union[bytes, int]], Dict[str, Optional[bytes]], Dict[str, Optional[*Message*]], Dict[str, None]]

**Returns** raw bytes and source when it exist. if queue timeout is reached return None

**_cc_send**(**args*, ***kwargs*)

Populate the queue in of the proxy connector.

**Parameters**

- **args** (tuple) – tuple containing positionnal arguments
- **kwargs** (dict) – dictionary containing named arguments

**Return type** None

### cc_pcan_can

### Can Communication Channel using PCAN hardware

**module** cc_pcan_can

**synopsis** CChannel implementation for CAN(fd) using PCAN API from python-can

**class** pykiso.lib.connectors.cc_pcan_can.**CCPCanCan**(*interface='pcan'*, *channel='PCAN_USBBUS1'*, *state='ACTIVE'*, *trace_path=''*, *trace_size=10*, *bitrate=500000*, *is_fd=True*, *enable_brs=False*, *f_clock_mhz=80*, *nom_brp=2*, *nom_tseg1=63*, *nom_tseg2=16*, *nom_sjw=16*, *data_brp=4*, *data_tseg1=7*, *data_tseg2=2*, *data_sjw=2*, *is_extended_id=False*, *remote_id=None*, *can_filters=None*, *logging_activated=True*, *bus_error_warning_filter=False*, ***kwargs*)

CAN FD channel-adapter.

Initialize can channel settings.

**Parameters**

- **interface** (str) – python-can interface modules used
- **channel** (str) – the can interface name
- **state** (str) – BusState of the channel
- **trace_path** (str) – path to write the trace
- **trace_size** (int) – maximum size of the trace (in MB)
- **bitrate** (int) – Bitrate of channel in bit/s,ignored if using CanFD
- **is_fd** (bool) – Should the Bus be initialized in CAN-FD mode
- **enable_brs** (bool) – sets the bitrate_switch flag to use higher transmission speed
- **f_clock_mhz** (int) – Clock rate in MHz
- **nom_brp** (int) – Clock prescaler for nominal time quantum
- **nom_tseg1** (int) – Time segment 1 for nominal bit rate, that is, the number of quanta from the Sync Segment to the sampling point
- **nom_tseg2** (int) – Time segment 2 for nominal bit rate, that is, the number of quanta from the sampling point to the end of the bit
- **nom_sjw** (int) – Synchronization Jump Width for nominal bit rate. Decides the maximum number of time quanta that the controller can resynchronize every bit
- **data_brp** (int) – Clock prescaler for fast data time quantum
- **data_tseg1** (int) – Time segment 1 for fast data bit rate, that is, the number of quanta from the Sync Segment to the sampling point
- **data_tseg2** (int) – Time segment 2 for fast data bit rate, that is, the number of quanta from the sampling point to the end of the bit. In the range (1..16)
- **data_sjw** (int) – Synchronization Jump Width for fast data bit rate
- **is_extended_id** (bool) – This flag controls the size of the arbitration_id field
- **remote_id** (Optional[int]) – id used for transmission

- **can_filters** (Optional[list]) – iterable used to filter can id on reception
- **logging_activated** (bool) – boolean used to disable logfile creation

:param bus_error_warning_filter : if True filter the logging message ('Bus error: an error counter')

_cc_close()
Close the current can bus channel and uninitialize PCAN handle.

**Return type** None

_cc_open()
Open a can bus channel, set filters for reception and activate PCAN log.

**Return type** None

_cc_receive(*timeout=0.0001*, *raw=False*)
Receive a can message using configured filters.

If raw parameter is set to True return received message as it is (bytes) otherwise test entity protocol format is used and Message class type is returned.

**Parameters**

- **timeout** (float) – timeout applied on reception
- **raw** (bool) – boolean use to select test entity protocol format

**Return type** Dict[str, Union[*Message*, bytes, int]]

**Returns** the received data and the source can id

_cc_send(*msg*, *raw=False*, ***kwargs*)
Send a CAN message at the configured id.

If remote_id parameter is not given take configured ones, in addition if raw is set to True take the msg parameter as it is otherwise parse it using test entity protocol format.

**Parameters**

- **msg** (Union[*Message*, bytes]) – data to send
- **raw** (bool) – boolean use to select test entity protocol format
- **kwargs** – named arguments

**Return type** None

_pcan_configure_trace()
Configure PCAN dongle to create a trace file.

If self.logging_path is set, this path will be created, if it does not exist and the logfile will be placed there. Otherwise it will be logged to the current working directory if a default filename, which will be overwritten in successive calls. If an error occurs, the trace will not be started and the error logged. No exception is thrown in this case.

**Return type** None

_pcan_set_value(*channel*, *parameter*, *buffer*)
Set a value in the PCAN api.

If this is not successful, a RuntimeError is returned, as well as the PCAN error text is logged, if possible.

**Parameters**

- **channel** – Channel for PCANBasic.SetValue
- **parameter** – Parameter for PCANBasic.SetValue

- **buffer** – Buffer for PCANBasic.SetValue

**Raises** **RuntimeError** – Raised if the function is not successful

**Return type** None

**timeout**
Extract the base logging directory from the logging module, so we can create our logging folder in the correct place. logging_path will be set to the parent directory of the logfile which is set in the logging module + /raw/PCAN If an AttributeError occurs, the logging module is not set to log into a file. In this case we set the logging_path to None and will just log into a generic logfile in the current working directory, which will be overwritten every time, a log is initiated.

**class** pykiso.lib.connectors.cc_pcan_can.**PcanFilter**(*name=''*)
Filter specific pcan logging messages

Initialize a filter.

Initialize with the name of the logger which, together with its children, will have its events allowed through the filter. If no name is specified, allow every event.

**filter**(*record*)
Determine if the specified record is to be logged. It will not if it is a pcan bus error message

**Parameters** **record** (LogRecord) – record of the event to filter if it is a pcan bus error

**Return type** bool

**Returns** True if the record should be logged, or False otherwise.

### cc_proxy

### Proxy Channel

**module** cc_proxy

**synopsis** CChannel implementation for multi-auxiliary usage.

CCProxy channel was created, in order to enable the connection of multiple auxiliaries on one and only one CChannel. This CChannel has to be used with a so called proxy auxiliary.

**class** pykiso.lib.connectors.cc_proxy.**CCProxy**(***kwargs*)
Proxy CChannel for multi auxiliary usage.

Initialize attributes.

**_cc_close**()
Close proxy channel.

**Return type** None

**_cc_open**()
Open proxy channel.

**Return type** None

**_cc_receive**(*timeout=0.1*, *raw=False*)
Depopulate the queue out of the proxy connector.

**Parameters**

- **timeout** (float) – not used
- **raw** (bool) – not used

**Return type** Union[Dict[str, Union[bytes, int]], Dict[str, Optional[bytes]], Dict[str, Optional[*Message*]], Dict[str, None]]

**Returns** raw bytes and source when it exist. if queue timeout is reached return None

**_cc_send**(**args*, ***kwargs*)
Populate the queue in of the proxy connector.

**Parameters**

- **args** (tuple) – tuple containing positionnal arguments
- **kwargs** (dict) – dictionary containing named arguments

**Return type** None

**attach_tx_callback**(*func*)
Attach to a callback to the _cc_send method.

**Parameters** **func** (Callable) – function to call when _cc_send is called

**Return type** None

**detach_tx_callback**()
Detach the current callback.

**Return type** None

### cc_raw_loopback

### Loopback CChannel

**module** cc_raw_loopback

**synopsis** Loopback CChannel for testing purposes.

**class** pykiso.lib.connectors.cc_raw_loopback.**CCLoopback**(***kwargs*)
Loopback CChannel for testing purposes.

Whatever gets sent via cc_send will land in a FIFO and can be received via cc_receive.

Constructor.

**Parameters** **processing** – if multiprocessing object is used.

**_cc_close**()
Close loopback channel.

**Return type** None

**_cc_open**()
Open loopback channel.

**Return type** None

**_cc_receive**(*timeout*, *raw=True*)
Read message by simply removing an element from the left side of deque.

**Parameters**

- **timeout** (float) – timeout applied on receive event
- **raw** (bool) – if raw is True return raw bytes, otherwise Message type like

**Return type** Dict[str, Union[*Message*, bytes, str]]

**Returns** Message or raw bytes if successful, otherwise None

**_cc_send**(*msg*, *raw=True*)
Send a message by simply putting message in deque.

**Parameters**

- **msg** (Union[*Message*, bytes, str]) – message to send, should be Message type or bytes.
- **raw** (bool) – if raw is True simply send it as it is, otherwise apply serialization

**Return type** None

### cc_rtt_segger

### Communication Channel Via segger j-link

**module** cc_rtt_segger

**synopsis** channel used to enable RTT communication using Segger J-Link debugger. Additionally, RTT logs can be captured by setting the rtt_log_path parameter on the specified channel.

**class** pykiso.lib.connectors.cc_rtt_segger.**CCRttSegger**(*serial_number=None*, *chip_name='STM32L562QE'*, *speed=4000*, *block_address=537131008*, *verbose=False*, *tx_buffer_idx=3*, *rx_buffer_idx=0*, *rtt_log_path=None*, *rtt_log_buffer_idx=0*, *rtt_log_speed=1000*, *connection_timeout=5*, ***kwargs*)
Channel using RTT to communicate through Segger J-Link debugger.

Initialize attributes.

**Parameters**

- **serial_number** (Optional[int]) – optional segger debugger serial number (required if many connected)
- **chip_name** (str) – microcontoller name (STM. . . .)
- **speed** (int) – communication speed in Hz
- **block_address** (int) – start address to start RTT communication
- **tx_buffer_idx** (int) – buffer index used for transmission
- **rx_buffer_idx** (int) – buffer index used for reception
- **verbose** (bool) – boolean indicating if J-Link connection should be verbose in logging
- **rtt_log_path** (Optional[str]) – path to the folder where the RTT log file should be stored
- **rtt_log_buffer_idx** (int) – buffer index used for RTT logging
- **rtt_log_speed** (float) – number of log per second to be pulled (manage the CPU load for logging) None value fetch log at the CPU's speed. Default 1000 logs/s
- **connection_timeout** (int) – available time (in seconds) to open the connection

**_cc_close**()
Close current RTT communication in use.

**Return type** None

_cc_open()
Connect debugger/microcontroller.

This method proceed to the following actions : - create a JLink class instance - connect to the debugger(using open method) - set debugger interface to SWD - connect debugger to the specified chip - start RTT communication - start RTT Logging the specified channel if activated

**Raises** JLinkRTTException – if connection timeout occurred.

**Return type** None

_cc_receive(*timeout=0.1*, *raw=False*)
Read message from the corresponding RTT buffer.

**Parameters**

- **timeout** (float) – timeout applied on receive event
- **raw** (bool) – if raw is True return raw bytes, otherwise Message type like

**Return type** Dict[str, Union[*Message*, bytes, None]]

**Returns** Message or raw bytes if successful, otherwise None

_cc_send(*msg*, *raw=False*)
Send message using the corresponding RTT buffer.

**Parameters**

- **msg** (*Message*) – message to send, should be Message type or bytes.
- **raw** (bool) – if raw is True simply send it as it is, otherwise apply serialization

**Return type** None

read_target_memory(*addr*, *num_units*, *zone=None*, *nbits=32*)
Read the given target's memory units and the given address.

---

**Note:** The optional zone specifies a memory zone to access to read from, e.g. IDATA, DDATA, or CODE.

---

**Warning:** The given number of bits, if provided, must be either 8, 16, or 32. If not provided, always reads 32 bits.

**Parameters**

- **addr** (int) – start address to read from
- **num_units** (int) – number of units to read
- **zone** (Optional[str]) – optional memory zone name to access
- **nbits** (int) – number of bits to use for each unit

**Return type** Optional[list]

**Returns** List of units read from the target.

receive_log()
Receive RTT log messages from the corresponding RTT buffer.

**Return type** None

**reset_target**(*wait_time=100*, *halt=False*)
Reset target via JLink.

**Parameters**

- **wait_time** (int) – Amount of milliseconds to delay after reset
- **halt** (bool) – if the CPU should halt after reset

**Return type** None

pykiso.lib.connectors.cc_rtt_segger.**_need_connection**(*f*)
Decorator to check the JLink is connected and raises an error otherwise

pykiso.lib.connectors.cc_rtt_segger.**_need_rtt**(*f*)
Decorator to check that a RTT connection has been configured and raises an error otherwise

### cc_serial

### Communication Channel Via Serial

**module** cc_serial

**synopsis** Serial communication channel

**class** pykiso.lib.connectors.cc_serial.**ByteSize**(*value*)
An enumeration.

**class** pykiso.lib.connectors.cc_serial.**CCSerial**(*port*, *baudrate=9600*, *bytesize=ByteSize.EIGHT_BITS*, *parity=Parity.PARITY_NONE*, *stopbits=StopBits.STOPBITS_ONE*, *timeout=None*, *xonxoff=False*, *rtscts=False*, *write_timeout=None*, *dsrdtr=False*, *inter_byte_timeout=None*, *exclusive=None*, ***kwargs*)
Connector for serial devices

Init Serial settings

**Parameters**

- **port** (str) – Device name (e.g. "COM1" for Windows or "/dev/ttyACM0" for Linux)
- **baudrate** (int) – Baud rate such as 9600 or 115200 etc, defaults to 9600
- **bytesize** (*ByteSize*) – Number of data bits. Possible values: FIVEBITS, SIXBITS, SEVENBITS, EIGHTBITS, defaults to EIGHTBITS
- **parity** (*Parity*) – Enable parity checking. Possible values: PARITY_NONE, PARITY_EVEN, PARITY_ODD PARITY_MARK, PARITY_SPACE, defaults to PARITY_NONE
- **stopbits** (*StopBits*) – Number of stop bits. Possible values: STOPBITS_ONE, STOPBITS_ONE_POINT_FIVE, STOPBITS_TWO, defaults to STOPBITS_ONE
- **timeout** (Optional[float]) – Set a read timeout value in seconds, defaults to None
- **xonxoff** (bool) – Enable software flow contro, defaults to False
- **rtscts** (bool) – Enable hardware (RTS/CTS) flow control, defaults to False
- **write_timeout** (Optional[float]) – Set a write timeout value in seconds, defaults to None

- **dsrdtr** (bool) – Enable hardware (DSR/DTR) flow control, defaults to False
- **inter_byte_timeout** (Optional[float]) – Inter-character timeout, None to disable, defaults to None
- **exclusive** (Optional[bool]) – Set exclusive access mode (POSIX only). A port cannot be opened in exclusive access mode if it is already open in exclusive access mode., defaults to None

**_cc_close**()
Close serial port

**Return type** None

**_cc_open**()
Open serial port

**Return type** None

**_cc_receive**(*timeout=1e-05*, *raw=True*)
Read bytes from the serial port. Try to read one byte in blocking mode. After blocking read check remaining bytes and read them without a blocking call.

**Parameters**

- **timeout** – timeout in seconds, 0 for non blocking read, defaults to 0.00001
- **raw** (bool) – raw mode only, defaults to True

**Raises** **NotImplementedError** – if raw is to True

**Return type** Dict[str, bytes]

**Returns** received bytes

**_cc_send**(*msg*, *raw=True*, *timeout=None*)
Sends data to the serial port

**Parameters**

- **msg** (ByteString) – data to send
- **raw** (bool) – unused
- **timeout** (Optional[float]) – write timeout in seconds. None sets it to blocking, defaults to None

**Raises** SerialTimeoutException - In case a write timeout is configured for the port and the time is exceeded.

**Return type** None

class pykiso.lib.connectors.cc_serial.**Parity**(*value*)
An enumeration.

**_member_type_**
alias of str

class pykiso.lib.connectors.cc_serial.**StopBits**(*value*)
An enumeration.

### cc_socket_can

### Setup SocketCAN

To use the socketCAN connector you have to make sure that your can socket has been initialized correctly.

```
sudo ip link set can0 up type can bitrate 500000 sample-point 0.75 dbitrate 2000000␣
↪dsample-point 0.8 fd on
sudo ip link set up can0
```

Make sure that ifconfig shows a socket can interface. Example shows can0 as available interface:

```
ifconfig
# outputs->
can0: flags=193<UP,RUNNING,NOARP>  mtu 72
        unspec 00-00-00-00-00-00-00-00-00-00-00-00-00-00-00-00  txqueuelen 1000  (UNSPEC)
        RX packets 30  bytes 90 (90.0 B)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 30  bytes 90 (90.0 B)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
```

**Warning:** SocketCAN is only available under Linux.

### Can Communication Channel SocketCAN

**module** cc_socket_can

**synopsis** CChannel implementation for CAN(fd) using SocketCAN

**class** pykiso.lib.connectors.cc_socket_can.cc_socket_can.**CCSocketCan**(*channel='vcan0'*, *remote_id=None*, *is_fd=True*, *enable_brs=False*, *can_filters=None*, *is_extended_id=False*, *receive_own_messages=False*, *logging_activated=False*, *log_path=None*, *log_name=None*, ***kwargs*)

CAN FD channel-adapter.

Initialize can channel settings.

**Parameters**

- **channel** (str) – the can interface name. (i.e. vcan0, can1, ..)
- **remote_id** (Optional[int]) – id used for transmission
- **is_fd** (bool) – should the Bus be initialized in CAN-FD mode
- **enable_brs** (bool) – sets the bitrate_switch flag to use higher transmission speed
- **can_filters** (Optional[list]) – iterable used to filter can id on reception

- **is_extended_id** (bool) – this flag controls the size of the arbitration_id field
- **receive_own_messages** (bool) – if set transmitted messages will be received
- **logging_activated** (bool) – boolean used to enable logfile creation
- **log_path** (Optional[str]) – trace directory path (absolute or relative)
- **log_name** (Optional[str]) – trace full name (without file extension)

_cc_close()
Close the current can bus channel and close the log handler.

**Return type** None

_cc_open()
Open a can bus channel, set filters for reception and activate

**Return type** None

_cc_receive(*timeout=0.0001*, *raw=False*)
Receive a can message using configured filters.

If raw parameter is set to True return received message as it is (bytes) otherwise test entity protocol format is used and Message class type is returned.

**Parameters**

- **timeout** (float) – timeout applied on reception
- **raw** (bool) – boolean use to select test entity protocol format

**Return type** Dict[str, Union[*Message*, bytes, int]]

**Returns** tuple containing the received data and the source can id

_cc_send(*msg*, *raw=False*, ***kwargs*)
Send a CAN message at the configured id.

If remote_id parameter is not given take configured ones, in addition if raw is set to True take the msg parameter as it is otherwise parse it using test entity protocol format.

**Parameters**

- **msg** (Union[*Message*, bytes]) – data to send
- **remote_id** – destination can id used
- **raw** (bool) – boolean use to select test entity protocol format

**Return type** None

pykiso.lib.connectors.cc_socket_can.cc_socket_can.**os_name**()
Returns the system/OS name.

**Return type** str

**Returns** os name such as 'Linux', 'Darwin', 'Java', 'Windows'

### cc_tcp_ip

### Communication Channel via socket

**module** cc_socket

**synopsis** connector for communication via socket

**class** pykiso.lib.connectors.cc_tcp_ip.**CCTcpip**(*dest_ip*, *dest_port*, *max_msg_size=256*, ***kwargs*)
Connector channel used to communicate via socket

Initialize channel settings.

**Parameters**

- **dest_ip** (str) – destination ip address
- **dest_port** (int) – destination port
- **max_msg_size** (int) – the maximum amount of data to be received at once

**_cc_close**()
Close UDP socket.

**Return type** None

**_cc_open**()
Connect to socket with configured port and IP address.

**Return type** None

**_cc_receive**(*timeout=0.01*, *raw=False*)
Read message from socket.

**Parameters**

- **timeout** – time in second to wait for reading a message
- **raw** (bool) – should the message be returned raw or should it be interpreted as a pykiso.Message?

**Return type** Dict[str, Union[bytes, str, None]]

**Returns** Message if successful, otherwise none

**_cc_send**(*msg*, *raw=False*)
Send a message via socket.

**Parameters**

- **msg** (bytes) – message to send
- **raw** (bool) – is the message in a raw format (True) or is it a string (False)?

**Return type** None

### cc_uart

### Communication Channel Via Uart

**module** cc_uart

**synopsis** Uart communication channel

**class** pykiso.lib.connectors.cc_uart.**CCUart**(*serialPort*, *baudrate=9600*, ***kwargs*)
UART implementation of the coordination channel.

Constructor.

**Parameters** **processing** – if multiprocessing object is used.

**_cc_close**()
Close the channel.

**_cc_open**()
Open the channel.

**_cc_receive**(*timeout=1e-05*, *raw=False*)
How to receive something from the channel.

**Parameters**

- **timeout** – Time to wait in second for a message to be received
- **raw** – send raw message without further work (default: False)

**Returns** message.Message() - If one received / None - If not

**_cc_send**(*msg*)
Sends the message on the channel.

**Parameters**

- **msg** – Message to send out
- **raw** – send raw message without further work (default: False)
- **kwargs** – named arguments

**exception** pykiso.lib.connectors.cc_uart.**IncompleteCCMsgError**(*value*)

### cc_udp

### Communication Channel Via Udp

**module** cc_udp

**synopsis** Udp communication channel

**class** pykiso.lib.connectors.cc_udp.**CCUdp**(*dest_ip*, *dest_port*, ***kwargs*)
UDP implementation of the coordination channel.

Initialize attributes.

**Parameters**

- **dest_ip** (str) – destination ip address
- **dest_port** (int) – destination port

_cc_close()
Close the udp socket.

**Return type** None

_cc_open()
Open the udp socket.

**Return type** None

_cc_receive(*timeout=1e-07*, *raw=False*)
Read message from socket.

**Parameters**

- **timeout** (float) – timeout applied on receive event
- **raw** (bool) – if raw is True return raw bytes, otherwise Message type like

**Return type** Dict[str, Union[*Message*, bytes, None]]

**Returns** Message or raw bytes if successful, otherwise None

_cc_send(*msg*, *raw=False*)
Send message using udp socket

**Parameters**

- **msg** (bytes) – message to send, should be Message type or bytes.
- **raw** (bool) – if raw is True simply send it as it is, otherwise apply serialization

**Return type** None

### cc_udp_server

### Communication Channel via UDP server

**module** cc_udp_server

**synopsis** basic UDP server

**Warning:** if multiple clients are connected to this server, ensure that each client receives all necessary responses before receiving messages again. Otherwise the responses may be sent to the wrong client

class pykiso.lib.connectors.cc_udp_server.CCUdpServer(*dest_ip*, *dest_port*, ***kwargs*)
Connector channel used to set up an UDP server.

Initialize attributes.

**Parameters**

- **dest_ip** (str) – destination port
- **dest_port** (int) – destination port

_cc_close()
Close UDP socket.

**Return type** None

_cc_open()
Bind UDP socket with configured port and IP address.

**Return type** None

**_cc_receive**(*timeout=1e-07*, *raw=False*)
Read message from UDP socket.

**Parameters**

- **timeout** – timeout applied on receive event
- **raw** (bool) – should the message be returned raw or should it be interpreted as a pykiso.Message?

**Return type** Dict[str, Union[*Message*, bytes, None]]

**Returns** Message if successful, otherwise none

**_cc_send**(*msg*, *raw=False*)
Send back a UDP message to the previous sender.

**Parameters** **msg** (bytes) – message instance to serialize into bytes

**Return type** None

### cc_usb

### Communication Channel Via Usb

**module** cc_usb

**synopsis** Usb communication channel

**class** pykiso.lib.connectors.cc_usb.**CCUsb**(*serial_port*)
Constructor.

**Parameters** **processing** – if multiprocessing object is used.

**_cc_send**(*msg*, *raw=False*)
Sends the message on the channel.

**Parameters**

- **msg** – Message to send out
- **raw** – send raw message without further work (default: False)
- **kwargs** – named arguments

### cc_vector_can

### CAN Communication Channel using Vector hardware

**module** cc_vector_can

**synopsis** CChannel implementation for CAN(fd) using Vector API from python-can

class pykiso.lib.connectors.cc_vector_can.**CCVectorCan**(*bustype='vector'*, *poll_interval=0.01*, *rx_queue_size=524288*, *serial=None*, *channel=3*, *bitrate=500000*, *data_bitrate=2000000*, *fd=True*, *enable_brs=False*, *app_name=None*, *can_filters=None*, *is_extended_id=False*, ***kwargs*)

CAN FD channel-adapter.

Initialize can channel settings.

**Parameters**

- **bustype** (str) – python-can interface modules used
- **poll_interval** (float) – Poll interval in seconds.
- **rx_queue_size** (int) – Number of messages in receive queue
- **serial** (Optional[int]) – Vector Box's serial number. Can be replaced by the "AUTO" flag to trigger the Vector Box automatic detection.
- **channel** (int) – The channel indexes to create this bus with
- **bitrate** (int) – Bitrate in bits/s.
- **app_name** (Optional[str]) – Name of application in Hardware Config. If set to None, the channel should be a global channel index.
- **data_bitrate** (int) – Which bitrate to use for data phase in CAN FD.
- **fd** (bool) – If CAN-FD frames should be supported.
- **enable_brs** (bool) – sets the bitrate_switch flag to use higher transmission speed
- **can_filters** (Optional[list]) – A iterable of dictionaries each containing a "can_id", a "can_mask", and an optional "extended" key.
- **is_extended_id** (bool) – This flag controls the size of the arbitration_id field.

**_cc_close**()

Close the current can bus channel.

**Return type** None

**_cc_open**()

Open a can bus channel and set filters for reception.

**Return type** None

**_cc_receive**(*timeout=0.0001*, *raw=False*)

Receive a can message using configured filters.

If raw parameter is set to True return received message as it is (bytes) otherwise test entity protocol format is used and Message class type is returned.

**Parameters**

- **timeout** – timeout applied on reception
- **raw** (bool) – boolean use to select test entity protocol format

**Return type** Dict[str, Union[*Message*, bytes, int]]

**Returns** the received data and the source can id

_cc_send(*msg*, *raw=False*, ***kwargs*)
Send a CAN message at the configured id.

If remote_id parameter is not given take configured ones, in addition if raw is set to True take the msg parameter as it is otherwise parse it using test entity protocol format.

**Parameters**

- **msg** – data to send
- **raw** (bool) – boolean use to select test entity protocol format
- **kwargs** – destination can id used

**Return type** None

pykiso.lib.connectors.cc_vector_can.**detect_serial_number**()
Provide the serial number of the currently available Vector Box to be used.

If several Vector Boxes are detected, the one with the lowest serial number is selected. If no Vector Box is connected, a ConnectionRefused error is thrown.

**Return type** int

**Returns** the Vector Box serial number

**Raises** **ConnectionRefusedError** – raised if no Vector box is currently available

### cc_visa

### Communication Channel using VISA protocol

**module** cc_visa

**synopsis** VISA communication channel to communicate to instruments using SCPI protocol.

class pykiso.lib.connectors.cc_visa.**VISAChannel**(***kwargs*)
VISA Interface for devices communicating with SCPI

Initialize channel settings.

_cc_close()
Close a resource

**Return type** None

abstract _cc_open()
Open an instrument

**Return type** None

_cc_receive(*timeout=0.1*, *raw=False*)
Send a read request to the instrument

**Parameters**

- **timeout** (float) – time in second to wait for reading a message
- **raw** (bool) – should the message be returned raw or should it be interpreted as a pykiso.Message?

**Return type** str

**Returns** the received response message, or an empty string if the request expired with a timeout.

_cc_send(*msg*, *raw=False*)
Send a write request to the instrument

**Parameters**

- **msg** (Union[*Message*, bytes, str]) – message to send
- **raw** (bool) – is the message in a raw format (True) or is it a string (False)?

**Return type** None

_process_request(*request*, *request_data=''*)
Send a SCPI request.

**Parameters**

- **request** (str) – command request to the instrument (write, read or query)
- **request_data** (str) – command payload (for write and query requests only)

**Return type** str

**Returns** response message from the instrument (read and query requests) or an empty string for write requests and if read or query request failed.

query(*query_command*)
Send a query request to the instrument

**Parameters** **query_command** (str) – query command to send

**Return type** str

**Returns** Response message, None if the request expired with a timeout.

class pykiso.lib.connectors.cc_visa.**VISASerial**(*serial_port*, *baud_rate=9600*, ***kwargs*)
Connector used to communicate with an instrument via Serial.

Initialize channel attributes.

**Parameters**

- **serial_port** (int) – COM port to use to connect to the instrument
- **baud_rate** – baud rate used to communicate with the instrument

_cc_open()
Open an instrument via serial

**Return type** None

class pykiso.lib.connectors.cc_visa.**VISATcpip**(*ip_address*, *protocol='INSTR'*, ***kwargs*)
Connector used to communicate with an instrument via TCPIP

Initialize channel attributes.

**Parameters**

- **ip_address** (str) – target instrument's ip address
- **protocol** – communication protocol to use

_cc_open()
Open a remote instrument via TCPIP

**Return type** None

### 6.2.2 Flashers

#### flash_jlink

#### JLink Flasher

**module** flash_jlink

**synopsis** a Flasher adapter of the pylink-square library

**class** pykiso.lib.connectors.flash_jlink.**JLinkFlasher**(*binary=None*, *lib=None*, *serial_number=None*, *chip_name='STM32L562QE'*, *speed=9600*, *verbose=False*, *power_on=False*, *start_addr=0*, *xml_path=None*, ***kwargs*)

A Flasher adapter of the pylink-square library.

Constructor.

**Parameters**

- **binary** (Union[str, Path, None]) – path to the binary firmware file
- **lib** (Union[str, Path, None]) – path to the location of the JLink.so/JLink.DLL, usually automatically determined
- **serial_number** (Optional[int]) – optional debugger's S/N (required if many connected) (see pylink-square documentation)
- **chip_name** (str) – see pylink-square documentation
- **speed** (int) – see pylink-square documentation
- **verbose** (bool) – see pylink-square documentation
- **power_on** (bool) – see pylink-square documentation
- **start_addr** (int) – see pylink-square documentation
- **xml_path** (Optional[str]) – device configuration (see pylink-square documentation)

**close**()

Close flasher and free resources.

**Return type** None

**flash**()

¨Perform firmware delivery.

**Raises** **pylink.JLinkException** – if any hardware related error occurred during flashing.

**Return type** None

**open**()

Initialize the flasher.

**Return type** None

### flash_lauterbach

### Lauterbach Flasher

**module** flash_lauterbach

**synopsis** used to flash through lauterbach probe.

class pykiso.lib.connectors.flash_lauterbach.**LauterbachFlasher**(*t32_exc_path=None*, *t32_config=None*, *t32_script_path=None*, *t32_api_path=None*, *port=None*, *node='localhost'*, *packlen='1024'*, *device=1*, ***kwargs*)

Connector used to flash through one and only one Lauterbach probe using Trace32 as remote API.

Initialize attributes with configuration data.

**Parameters**

- **t32_exc_path** (Optional[str]) – full path of Trace32 app to execute
- **t32_config** (Optional[str]) – full path of Trace32 configuration file
- **t32_script_path** (Optional[str]) – full path to .cmm flash script to execute
- **t32_api_path** (Optional[str]) – full path of remote api
- **port** (Optional[str]) – port number used for UDP communication
- **node** (str) – node name (default localhost)
- **packlen** (str) – data pack length for UDP communication (default 1024)
- **device** (int) – configure device number given by Trace32 (default 1)

close()

Close UDP socket and shut down Trace32 App.

**Return type** None

flash()

Flash software using configured .cmm script.

**The Flash command leads to the following sub-tasks execution :**

- Send to Trace32 CD.DO internal command (execute script)
- Wait until script is finished
- Get script execution verdict

**Raises** **Exception** – if Trace32 error occurred during flash.

**Return type** None

open()

Open UDP socket between ITF and Trace32 loaded app.

The open command leads to the following sub-tasks execution:

- Open a Trace32 app
- Load remote API using ctypes

- Configure UPD channel (Port/buffer size…)
- Open UDP connection
- Make a ping request

**Return type** None

class pykiso.lib.connectors.flash_lauterbach.**MessageLineState**(*value*)
Use to determine Message reading command.

class pykiso.lib.connectors.flash_lauterbach.**ScriptState**(*value*)
Use to determine script command execution.

#### cc_flasher_example

#### Fake Flasher Channel for testing

**module** cc_flasher_example

**synopsis** fake flasher implementation

class pykiso.lib.connectors.cc_flasher_example.**FlasherExample**(*name*, ***kwargs*)
A Flasher adapter for testing purpose only.

Constructor.

**Parameters**

- **name** (str) – flasher's alias
- **kwargs** – named arguments

close()
Close flasher and free resources.

**Return type** None

flash()
Fake a firmware update.

**Return type** None

open()
Initialize the flasher.

**Return type** None

## 6.3 Auxiliaries

### 6.3.1 Auxiliary interfaces

#### auxiliary

#### Auxiliary common Interface Definition

**module** auxiliary

**synopsis** base auxiliary interface

class pykiso.auxiliary.**AuxiliaryCommon**

Class use to encapsulate all common methods/attributes for both multiprocessing and thread auxiliary interface.

Auxiliary common attributes initialization.

**abort_command**(*blocking=True*, *timeout_in_s=25*)

Force test to abort.

**Parameters**

- **blocking** (bool) – If you want the command request to be blocking or not
- **timeout_in_s** (float) – Number of time (in s) you want to wait for an answer

**Return type** bool

**Returns** True - Abort was a success / False - if not

**create_copy**(**args*, ***config*)

Create a copy of the actual auxiliary instance with the new desired configuration.

**Note:** only named arguments have to be used

**Warning:** the call of create_copy will automatically suspend the current auxiliary until the it copy is destroyed

**Parameters** **config** (dict) – new desired auxiliary configuration

**Return type** *AuxiliaryCommon*

**Returns** a brand new auxiliary instance

**Raises** **Exception** – if positional parameters is given or unknown named parameters are given

**abstract create_instance**()

Handle auxiliary creation.

**Return type** bool

**abstract delete_instance**()

Handle auxiliary deletion.

**Return type** bool

**destroy_copy**()

Stop the current auxiliary copy and resume the original.

**Warning:** stop the copy auxiliary will automatically start the base/original one

**Return type** None

**lock_it**(*timeout_in_s*)

Lock to ensure exclusivity.

**Parameters** **timeout_in_s** (float) – How many second you want to wait for the lock

**Return type** bool

**Returns** True - Lock done / False - Lock failed

**resume**()
Resume current auxiliary's run, by running the create_instance method in the background.

> **Warning:** due to the usage of create_instance if an issue occurred the exception AuxiliaryCreationError is raised.

**Return type** None

**abstract run**()
Run function of the auxiliary.

**Return type** None

**run_command**(*cmd_message*, *cmd_data=None*, *blocking=True*, *timeout_in_s=0*)
Send a test request.

**Parameters**

- **cmd_message** (Union[*Message*, bytes, str]) – command request to the auxiliary
- **cmd_data** (Optional[Any]) – data you would like to populate the command with
- **blocking** (bool) – If you want the command request to be blocking or not
- **timeout_in_s** (int) – Number of time (in s) you want to wait for an answer

**Return type** bool

**Returns** True - Successfully sent / False - Failed by sending / None

**stop**()
Force the thread to stop itself.

**Return type** None

**suspend**()
Supend current auxiliary's run.

**Return type** None

**unlock_it**()
Unlock exclusivity

**Return type** None

**wait_and_get_report**(*blocking=False*, *timeout_in_s=0*)
Wait for the report of the previous sent test request.

**Parameters**

- **blocking** (bool) – True: wait for timeout to expire, False: return immediately
- **timeout_in_s** (int) – if blocking, wait the defined time in seconds

**Return type** Union[*Message*, bytes, str]

**Returns** a message.Message() - Message received / None - nothing received

### mp_auxiliary

### Multiprocessing based Auxiliary Interface

**module** mp_auxiliary

**synopsis** common multiprocessing based auxiliary interface

class pykiso.interfaces.mp_auxiliary.**MpAuxiliaryInterface**(*name=None*, *is_proxy_capable=False*, *activate_log=None*)

Defines the interface of all multiprocessing based auxiliaries.

Auxiliaries get configured by the Test Coordinator, get instantiated by the TestCases and in turn use Connectors.

Auxiliary initialization.

**Parameters**

- **name** (Optional[str]) – alias of the auxiliary instance
- **is_proxy_capable** (bool) – notify if the current auxiliary could be (or not) associated to a proxy-auxiliary.
- **activate_log** (Optional[List[str]]) – loggers to deactivate

**create_instance**()

Create an auxiliary instance and ensure the communication to it.

**Return type** bool

**Returns** verdict on instance creation, True if everything was fine otherwise False

**Raises** **AuxiliaryCreationError** – if instance creation failed

**delete_instance**()

Delete an auxiliary instance and its communication to it.

**Return type** bool

**Returns** verdict on instance deletion, False if everything was fine otherwise True(instance was not deleted correctly)

**initialize_loggers**()

Initialize the logging mechanism for the current process.

**Return type** None

**run**()

Run function of the auxiliary process.

**Return type** None

### simple_auxiliary

### Simple Auxiliary Interface

**module** simple_auxiliary

**synopsis** common auxiliary interface for very simple auxiliary (without usage of thread or multiprocessing)

class pykiso.interfaces.simple_auxiliary.**SimpleAuxiliaryInterface**(*name=None*, *activate_log=None*)

Define the interface for all simple auxiliary where usage of thread or mulitprocessing is not necessary.

Auxiliary initialization.

**Parameters**

- **activate_log** (Optional[List[str]]) – loggers to deactivate
- **name** (Optional[str]) – alias of the auxiliary instance

**create_instance**()

Create an auxiliary instance and ensure the communication to it.

**Return type** bool

**Returns** True if creation was successful otherwise False

**Raises** **AuxiliaryCreationError** – if instance creation failed

**delete_instance**()

Delete an auxiliary instance and its communication to it.

**Return type** bool

**Returns** True if deletion was successful otherwise False

**resume**()

Resume current auxiliary's run, by running the create_instance method in the background.

> **Warning:** due to the usage of create_instance if an issue occurred the exception AuxiliaryCreationError is raised.

**Return type** None

**stop**()

Stop the auxiliary

**suspend**()

Suspend current auxiliary's run.

**Return type** None

### thread_auxiliary

### Thread based Auxiliary Interface

**module** thread_auxiliary

**synopsis** common thread based auxiliary interface

> **Warning:** AuxiliaryInterface will be deprecated in a few releases!

class pykiso.interfaces.thread_auxiliary.**AuxiliaryInterface**(*name=None*, *is_proxy_capable=False*, *activate_log=None*, *auto_start=True*)

Defines the Interface of all thread based auxiliaries.

Auxiliaries get configured by the Test Coordinator, get instantiated by the TestCases and in turn use Connectors.

Auxiliary initialization.

**Parameters**

- **name** (Optional[str]) – alias of the auxiliary instance
- **is_proxy_capable** (bool) – notify if the current auxiliary could be (or not) associated to a proxy-auxiliary.
- **activate_log** (Optional[List[str]]) – loggers to deactivate
- **auto_start** (bool) – determine if the auxiliayry is automatically started (magic import) or manually (by user)

**create_instance**()
Create an auxiliary instance and ensure the communication to it.

**Return type** bool

**Returns** message.Message() - Contain received message

**Raises** **AuxiliaryCreationError** – if instance creation failed

**delete_instance**()
Delete an auxiliary instance and its communication to it.

**Return type** bool

**Returns** message.Message() - Contain received message

**run**()
Run function of the auxiliary thread.

**Return type** None

**start**()
Start the thread and create the auxiliary only if auto_start flag is False.

**Return type** None

### double threaded auxiliary

### Double Threaded based Auxiliary Interface

**module** dt_auxiliary

**synopsis** common double threaded based auxiliary interface

class pykiso.interfaces.dt_auxiliary.**AuxCommand**(*value*)
Contain all available auxiliary's commands.

**CREATE_AUXILIARY = 1**
create auxiliary command id

**DELETE_AUXILIARY = 2**
delete auxiliary command id

class pykiso.interfaces.dt_auxiliary.**DTAuxiliaryInterface**(*name=None*, *is_proxy_capable=False*, *activate_log=None*, *tx_task_on=True*, *rx_task_on=True*, *auto_start=True*)
Common interface for all double threaded auxiliary. A so called << double threaded >> auxiliary, simply encapsulate two threads one for the reception and one for the transmmission.

Initialize auxiliary attributes

**Parameters**

- **name** (Optional[str]) – alias of the auxiliary instance
- **is_proxy_capable** (bool) – notify if the current auxiliary could be (or not) associated to a proxy-auxiliary.
- **activate_log** (Optional[List[str]]) – loggers to deactivate
- **tx_task_on** – enable or not the tx thread
- **rx_task_on** – enable or not the rx thread
- **auto_start** (bool) – determine if the auxiliayry is automatically started (magic import) or manually (by user)

**create_instance**()

Start auxiliary's running tasks and activities.

**Return type** bool

**Returns** True if the auxiliary is created otherwise False

**Raises** **AuxiliaryCreationError** – if instance creation failed

**delete_instance**()

Stop auxiliary's running tasks and activities.

**Return type** bool

**Returns** True if the auxiliary is deleted otherwise False

**resume**()

Resume current auxiliary's run.

> **Warning:** due to the usage of create_instance if an issue occurred the exception AuxiliaryCreationError is raised.

**Return type** bool

**Returns** True if the auxiliary is resumed otherwise False

**run_command**(*cmd_message*, *cmd_data=None*, *blocking=True*, *timeout_in_s=5*)

Send a request by transmitting it through queue_in and waiting for a response using queue_out.

**Parameters**

- **cmd_message** (Any) – command request to the auxiliary
- **cmd_data** (Optional[Any]) – data you would like to populate the command with
- **blocking** (bool) – If you want the command request to be blocking or not
- **timeout_in_s** (int) – Number of time (in s) you want to wait for an answer

**Return type** Any

**Returns** True if the request is correctly executed otherwise False

**start**()

Force the auxiliary to start all running tasks and activities.

> **Warning:** due to the usage of create_instance if an issue occurred the exception AuxiliaryCreationError is raised.

**Return type** bool

**Returns** True if the auxiliary is started otherwise False

**stop**()
Force the auxiliary to stop all running tasks and activities.

**Return type** bool

**Returns** True if the auxiliary is stopped otherwise False

**suspend**()
Supend current auxiliary's run.

**Return type** bool

**Returns** True if the auxiliary is suspend otherwise False

**wait_for_queue_out**(*blocking=False*, *timeout_in_s=0*)
Wait for data from the queue out.

**Parameters**

- **blocking** (bool) – True: wait for timeout to expire, False: return immediately
- **timeout_in_s** (int) – if blocking, wait the defined time in seconds

**Return type** Optional[Any]

**Returns** data contained in the auxiliary's queue_out

pykiso.interfaces.dt_auxiliary.**close_connector**(*func*)
Close current associated auxiliary's channel.

**Parameters** **func** (Callable) – decorated method

**Return type** Callable

**Returns** inner decorated function

pykiso.interfaces.dt_auxiliary.**flash_target**(*func*)
Flash firmware on the target, using associated auxiliary's flasher channel.

**Parameters** **func** (Callable) – decorated method

**Return type** Callable

**Returns** inner decorated function

pykiso.interfaces.dt_auxiliary.**open_connector**(*func*)
Open current associated auxiliary's channel.

**Parameters** **func** (Callable) – decorated method

**Return type** Callable

**Returns** inner decorated function

### 6.3.2 Included Auxiliaries

*pykiso* comes with some ready to use implementations of different auxiliaries.

#### acroname_auxiliary

Example can be found here *Controlling an acroname USB hub*.

#### communication_auxiliary

#### CommunicationAuxiliary

**module** communication_auxiliary

**synopsis** Auxiliary used to send raw bytes via a connector instead of pykiso.Messages

**class** pykiso.lib.auxiliaries.communication_auxiliary.**CommunicationAuxiliary**(*com*, ***kwargs*)

Auxiliary used to send raw bytes via a connector instead of pykiso.Messages.

Constructor.

**Parameters** **com** (*CChannel*) – CChannel that supports raw communication

**clear_buffer**()

Clear buffer from old stacked objects

**Return type** None

**receive_message**(*blocking=True*, *timeout_in_s=None*)

Receive a raw message.

**Parameters**

- **blocking** (bool) – wait for message till timeout elapses?
- **timeout_in_s** (Optional[float]) – maximum time in second to wait for a response

**Return type** Optional[bytes]

**Returns** raw message

**run_command**(*cmd_message*, *cmd_data=None*, *blocking=True*, *timeout_in_s=None*)

Send a request by transmitting it through queue_in and populate queue_tx with the command verdict (successful or not).

**Parameters**

- **cmd_message** (Any) – command to send
- **cmd_data** (Optional[Any]) – data you would like to populate the command with
- **blocking** (bool) – If you want the command request to be blocking or not
- **timeout_in_s** (Optional[int]) – Number of time (in s) you want to wait for an answer

**Return type** bool

**Returns** True if the request is correctly executed otherwise False

**send_message**(*raw_msg*)

Send a raw message (bytes) via the communication channel.

**Parameters** **raw_msg** (bytes) – message to send

**Return type** bool

**Returns** True if command was executed otherwise False

### dut_auxiliary

### Device Under Test Auxiliary

**module** DUTAuxiliary

**synopsis** The Device Under Test auxiliary allow to flash and run test on the target using the connector provided.

**class** pykiso.lib.auxiliaries.dut_auxiliary.**DUTAuxiliary**(*com=None*, *flash=None*, ***kwargs*)
Device Under Test(DUT) auxiliary implementation.

Constructor.

**Parameters**

- **name** – Alias of the auxiliary instance
- **com** (Optional[*CChannel*]) – Communication connector
- **flash** (Optional[*Flasher*]) – flash connector

**create_instance**()
Create DUT auxiliary instance.

Overridden from base interface in order to use the TX and RX tasks, and not duplicate auxiliary method. Execute directly the ping-pong to initiate the communication with the DUT.

**Return type** bool

**Returns** True if the auxiliary is created and ping-pong successful otherwise False

**Raises** **AuxiliaryCreationError** – if instance creation failed

**evaluate_report**(*report_msg*)
Evaluate the report type and log the appropriated message.

**Parameters** **report_msg** (*Message*) – reeceived report message

**Return type** None

**evaluate_response**(*response*)
Evaluate if the received message is knowned and type of report.

---

**Note:** if a log message type is received just log it

---

**Parameters** **response** (*Message*) – reeceived response

**Return type** bool

**Returns** True if the response is a report otherwise False

**send_abort_command**(**arg: tuple*, ***kwargs: dict*) → bool
Based on the run_command method return, force the auxiliary to create a brand new communication stream with the DUT (call of delete/create instance).

**Parameters**

- **self** – aux instance
- **arg** (tuple) – positional arguments
- **kwargs** (dict) – named arguments

**Return type** bool

**Returns** True if the command was acknowledged otherwise False

**send_fixture_command**(**arg: tuple*, ***kwargs: dict*) → bool
Check if an ACK message was received and if the token is valid.

**Parameters**

- **self** – aux instance
- **arg** (tuple) – positional arguments
- **kwargs** (dict) – named arguments

**Return type** bool

**Returns** True if the command was acknowledged otherwise False

**send_ping_command**(**arg: tuple*, ***kwargs: dict*) → bool
Check if an ACK message was received and if the token is valid.

**Parameters**

- **self** – aux instance
- **arg** (tuple) – positional arguments
- **kwargs** (dict) – named arguments

**Return type** bool

**Returns** True if the command was acknowledged otherwise False

**wait_and_get_report**(*blocking=False*, *timeout_in_s=0*)
Wait for the report coming from the DUT.

**Parameters**

- **blocking** (bool) – True: wait for timeout to expire, False: return immediately
- **timeout_in_s** (int) – if blocking, wait the defined time in seconds

**Return type** Optional[*Message*]

**Returns** if a report is received return it otherwise None

pykiso.lib.auxiliaries.dut_auxiliary.**check_acknowledgement**(*func*)
Check ifthe DUT has acknowledge the previous sent command.

**Parameters** **func** (Callable) – decorated method

**Return type** Callable

**Returns** decorator inner function

pykiso.lib.auxiliaries.dut_auxiliary.**restart_aux**(*func*)
Force he auxiliary restart if the command is not acknowledge

**Parameters** **func** (Callable) – decorated method

**Return type** Callable

**Returns** decorator inner function

pykiso.lib.auxiliaries.dut_auxiliary.**retry_command**(*tries*)
Force to resend the command a define number of times in case of failure.

**Parameters** **tries** (int) – maximum number of try to get the acknowledgement from the DUT

**Return type** Callable

**Returns** inner decorator function

### instrument_control_auxiliary

Example can be found here *Controlling an Instrument*.

### Instrument Control Auxiliary

**module** instrument_control

**synopsis** provide a simple interface to control instruments using SCPI protocol.

The functionalities provided in this package may be used directly inside ITF tests using the corresponding auxiliary, but also using a CLI.

**Warning:**

This auxiliary can only be used with the cc_visa or cc_tcp_ip connector.
It is not intended to be used with a proxy connector.
One instrument is bound to one auxiliary even if the instrument has multiple channels.

| | |
|---|---|
| *pykiso.lib.auxiliaries.instrument_control_auxiliary.instrument_control_auxiliary* | Instrument Control Auxiliary |
| *pykiso.lib.auxiliaries.instrument_control_auxiliary.instrument_control_cli* | Instrument Control CLI |
| *pykiso.lib.auxiliaries.instrument_control_auxiliary.lib_scpi_commands* | Library of SCPI commands |
| *pykiso.lib.auxiliaries.instrument_control_auxiliary.lib_instruments* | Library of instruments communicating via VISA |

### Instrument Control Auxiliary

**module** instrument_control_auxiliary

**synopsis** Auxiliary used to communicate via a VISA connector using the SCPI protocol.

**class** pykiso.lib.auxiliaries.instrument_control_auxiliary.instrument_control_auxiliary.**InstrumentControl**

Auxiliary used to communicate via a VISA connector using the SCPI protocol.

Constructor.

**Parameters**

- **com** (*CChannel*) – VISAChannel that supports VISA communication
- **instrument** – name of the instrument currently in use (will be used to adapt the SCPI commands)
- **write_termination** – write termination character
- **output_channel** (Optional[int]) – output channel to use on the instrument currently in use (if more than one)

**handle_query**(*query_command*)

**Send a query request to the instrument. Uses the 'query' method of the** channel if available, uses 'cc_send' and 'cc_receive' otherwise.

**Parameters** **query_command** (str) – query command to send

**Return type** str

**Returns** Response message, None if the request expired with a timeout.

**handle_read**()

Handle read command by calling associated connector cc_receive.

**Return type** str

**Returns** received response from instrument otherwise empty string

**handle_write**(*write_command*, *validation=None*)

Send a write request to the instrument and then returns if the value was successfully written. A query is sent immediately after the writing and the answer is compared to the expected one.

**Parameters**

- **write_command** (str) – write command to send
- **validation** (Optional[Tuple[str, Union[str, List[str]]]]) – tuple of the form (validation command (str), expected output (str or list of str))

**Return type** str

**Returns** status message depending on the command validation: SUCCESS, FAILURE or NO_VALIDATION

**query**(*query_command*)

**Send a query request to the instrument. Uses the 'query' method of the** channel if available, uses 'cc_send' and 'cc_receive' otherwise.

**Parameters** **query_command** (str) – query command to send

**Return type** Union[bytes, str]

**Returns** Response message, None if the request expired with a timeout.

**read**()
Send a read request to the instrument.

**Return type** Union[str, bool]

**Returns** received response from instrument otherwise empty string

**write**(*write_command*, *validation=None*)
Send a write request to the instrument.

**Parameters**

- **write_command** (str) – command to send
- **validation** (Optional[Tuple[str, Union[str, List[str]]]]) – contain validation criteria apply on the response

**Return type** str

### Instrument Control CLI

**module** instrument_control_cli

**synopsis** Command Line Interface used to communicate with an instrument using the SCPI protocol.

**class** pykiso.lib.auxiliaries.instrument_control_auxiliary.instrument_control_cli.**ExitCode**(*value*)
List of possible exit codes

**class** pykiso.lib.auxiliaries.instrument_control_auxiliary.instrument_control_cli.**Interface**(*value*)
List of available interfaces

pykiso.lib.auxiliaries.instrument_control_auxiliary.instrument_control_cli.**initialize_logging**(*log_level*)
Initialize the logging by setting the general log level

**Parameters** **log_level** (str) – any of DEBUG, INFO, WARNING, ERROR

**Return type** getLogger

**Returns** configured Logger

pykiso.lib.auxiliaries.instrument_control_auxiliary.instrument_control_cli.**parse_user_command**(*user_cmd*)
Parses the command from user input in interactive mode

**Parameters** **user_cmd** (str) – command provided by the user in interactive mode

**Return type** dict

**Returns** a single-item dictionary containing the parsed command as key the the corresponding payload as value

pykiso.lib.auxiliaries.instrument_control_auxiliary.instrument_control_cli.**perform_actions**(*instr_aux*, *actions*)

Performs the desired actions from the CLI arguments

**Parameters**

- **instr_aux** (*InstrumentControlAuxiliary*) – instrument on which to perform the actions
- **actions** (dict) – dictionary containing the parsed argument and the corresponding value.

**Return type** None

pykiso.lib.auxiliaries.instrument_control_auxiliary.instrument_control_cli.**setup_interface**(*interface*, *baud_rate=Non*, *ip_address=Nor*, *port=None*, *protocol=None*, *name=None*)

Set up the instrument auxiliary with the appropriate interface settings. The ip address must be provided in the case of TCPIP interfaces, as must the serial port for VISA_SERIAL interface. The baud rate and the output channel to use are optional.

**Parameters**

- **interface** (str) – interface to use
- **baud_rate** (Optional[int]) – baud rate to use
- **ip_address** (Optional[str]) – ip address of the remote instrument (used for remote control only)
- **port** (Optional[int]) – the port of the device to connect to. This is either a serial port for a VISA_SERIAL interface or an IP port in case of an TCPIP interfaces.
- **protocol** (Optional[str]) – The protocol to use for VISA_TCPIP interfaces.
- **name** (Optional[str]) – instrument name used to adapt the SCPI commands to be sent to the instrument

**Return type** *InstrumentControlAuxiliary*

**Returns** The created instrument auxiliary.

### Library of SCPI commands

**module** lib_scpi_commands

**synopsis** Library of helper functions used to send requests to instruments with SCPI protocol. This library can be used with any VISA instance having a write and a query method.

**class** pykiso.lib.auxiliaries.instrument_control_auxiliary.lib_scpi_commands.**LibSCPI**(*visa_object*, *instrument=''*)

Class containing common SCPI commands for write and query requests.

Constructor.

**Parameters**

- **visa_object** – any visa object having a write and a query method
- **instrument** (str) – name of the instrument in use. If registered, the commands adapted to this instrument's capabilities are used instead of the default ones.

disable_output()
Disable output on the currently selected output channel of an instrument.

**Return type** str

**Returns** the writing operation's status code

enable_output()
Enable output on the currently selected output channel of an instrument.

**Return type** str

**Returns** the writing operation's status code

get_all_errors()
Get all errors of an instrument.

return: list of off errors

get_command(*cmd_tag*, *cmd_type*, *cmd_validation=None*)
Return the pre-defined command.

**Parameters**

- **cmd_tag** (str) – command tag corresponding to the command to execute
- **cmd_type** (str) – either 'write' or 'query'
- **cmd_validation** (Optional[tuple]) – expected output after validation (only used in write commands)

**Return type** Tuple

**Returns** the associated command plus a tuple containing the associated query and the expected response (if cmd_validation is not none) otherwise None

get_current_limit_high()
Returns the current upper limit (in V) of an instrument.

**Return type** str

**Returns** the query's response message

get_current_limit_low()
Returns the current lower limit (in V) of an instrument.

**Return type** str

**Returns** the query's response message

get_identification()
Get the identification information of an instrument.

**Returns** the instrument's identification information

get_nominal_current()
Query the nominal current of an instrument on the selected channel (in A).

**Return type** str

**Returns** the nominal current

get_nominal_power()
Query the nominal power of an instrument on the selected channel (in W).

**Return type** str

**Returns** the nominal power

get_nominal_voltage()
Query the nominal voltage of an instrument on the selected channel (in V).

**Return type** str

**Returns** the nominal voltage

get_output_channel()
Get the currently selected output channel of an instrument.

**Return type** str

**Returns** the currently selected output channel

get_output_state()
Get the output status (ON or OFF, enabled or disabled) of the currently selected channel of an instrument.

**Return type** str

**Returns** the output state (ON or OFF)

get_power_limit_high()
Returns the power upper limit (in W) of an instrument.

**Return type** str

**Returns** the query's response message

get_remote_control_state()
Get the remote control mode (ON or OFF) of an instrument.

**Returns** the remote control state

get_status_byte()
Get the status byte of an instrument.

**Returns** the instrument's status byte

get_target_current()
Get the desired output current (in A) of an instrument.

**Return type** str

**Returns** the target current

get_target_power()
Get the desired output power (in W) of an instrument.

**Return type** str

**Returns** the target power

get_target_voltage()
Get the desired output voltage (in V) of an instrument.

**Return type** str

**Returns** the target voltage

get_voltage_limit_high()
Returns the voltage upper limit (in V) of an instrument.

**Return type** str

**Returns** the query's response message

**get_voltage_limit_low**()
Returns the voltage lower limit (in V) of an instrument.

**Return type** str

**Returns** the query's response message

**measure_current**()
Return the measured output current of an instrument (in A).

**Return type** str

**Returns** the measured current

**measure_power**()
Return the measured output power of an instrument (in W).

**Return type** str

**Returns** the measured power

**measure_voltage**()
Return the measured output voltage of an instrument (in V).

**Return type** str

**Returns** the measured voltage

**reset**()
Reset an instrument.

**Returns** NO_VALIDATION status code

**self_test**()
Performs a self-test of an instrument.

**Returns** the query's response message

**set_current_limit_high**(*limit_value*)
Set the current upper limit (in A) of an instrument.

**Parameters** **limit_value** (float) – limit value to be set on the instrument

**Return type** str

**Returns** the writing operation's status code

**set_current_limit_low**(*limit_value*)
Set the current lower limit (in A) of an instrument.

**Parameters** **limit_value** (float) – limit value to be set on the instrument

**Return type** str

**Returns** the writing operation's status code

**set_output_channel**(*channel*)
Set the output channel of an instrument.

**Parameters** **channel** (int) – the output channel to select on the instrument

**Return type** str

**Returns** the writing operation's status code

set_power_limit_high(*limit_value*)
Set the power upper limit (in W) of an instrument.

**Parameters** **limit_value** (float) – limit value to be set on the instrument

**Return type** str

**Returns** the writing operation's status code

set_remote_control_off()
Disable the remote control of an instrument. The instrument will respond to query and read commands only.

**Returns** the writing operation's status code

set_remote_control_on()
Enables the remote control of an instrument. The instrument will respond to all SCPI commands.

**Returns** the writing operation's status code

set_target_current(*value*)
Set the desired output current (in A) of an instrument.

**Parameters** **value** (float) – value to be set on the instrument

**Return type** str

**Returns** the writing operation's status code

set_target_power(*value*)
Set the desired output power (in W) of an instrument.

**Parameters** **value** (float) – value to be set on the instrument

**Return type** str

**Returns** the writing operation's status code

set_target_voltage(*value*)
Set the desired output voltage (in V) of an instrument.

**Parameters** **value** (float) – value to be set on the instrument

**Return type** str

**Returns** the writing operation's status code

set_voltage_limit_high(*limit_value*)
Set the voltage upper limit (in V) of an instrument.

**Parameters** **limit_value** (float) – limit value to be set on the instrument

**Return type** str

**Returns** the writing operation's status code

set_voltage_limit_low(*limit_value*)
Set the voltage lower limit (in V) of an instrument.

**Parameters** **limit_value** (float) – limit value to be set on the instrument

**Return type** str

**Returns** the writing operation's status code

### Library of instruments communicating via VISA

**module** lib_instruments

**synopsis** Dictionaries containing the appropriate SCPI commands for some instruments.

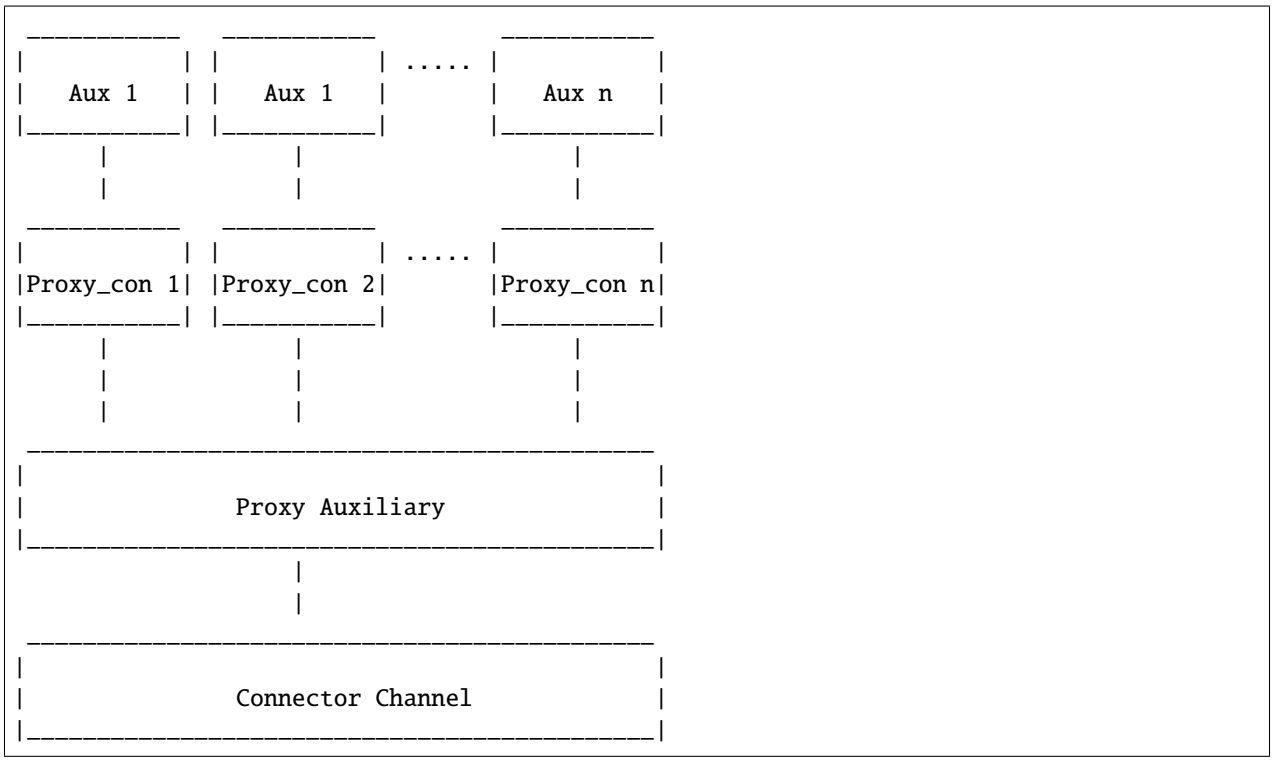
### mp_proxy_auxiliary

### Multiprocessing Proxy Auxiliary

**module** mp_proxy_auxiliary

**synopsis** concrete implementation of a multiprocessing proxy auxiliary

This auxiliary simply spread all commands and received messages to all connected auxiliaries. This auxiliary is only usable through mp proxy connector.




**class** pykiso.lib.auxiliaries.mp_proxy_auxiliary.**MpProxyAuxiliary**(*com*, *aux_list*, *activate_trace=False*, *trace_dir=None*, *trace_name=None*, ***kwargs*)

Proxy auxiliary for multi auxiliaries communication handling.

**..note :: this auxiliary version is using the multiprocessing** auxiliary interface.

Initialize attributes.

**Parameters**

- **com** (*CChannel*) – Communication connector
- **aux_list** (List[str]) – list of auxiliary's alias

- **activate_trace** (bool) – True if the trace is activate otherwise False
- **trace_dir** (Optional[str]) – trace directory path (absolute or relative)
- **trace_name** (Optional[str]) – trace full name (without file extension)

**get_proxy_con**(*aux_list*)

Retrieve all connector associated to all given existing Auxiliaries.

If auxiliary alias exists but auxiliary instance was not created yet, create it immediately using ConfigRegistry _aux_cache.

**Parameters** **aux_list** (List[str]) – list of auxiliary's alias

**Return type** Tuple[*AuxiliaryInterface*]

**Returns** tuple containing all connectors associated to all given auxiliaries

**run**()

Run function of the auxiliary process.

**Return type** None

**class** pykiso.lib.auxiliaries.mp_proxy_auxiliary.**TraceOptions**(*activate*, *dir*, *name*)

Create new instance of TraceOptions(activate, dir, name)

**property activate**

Alias for field number 0

**property dir**

Alias for field number 1

**property name**

Alias for field number 2

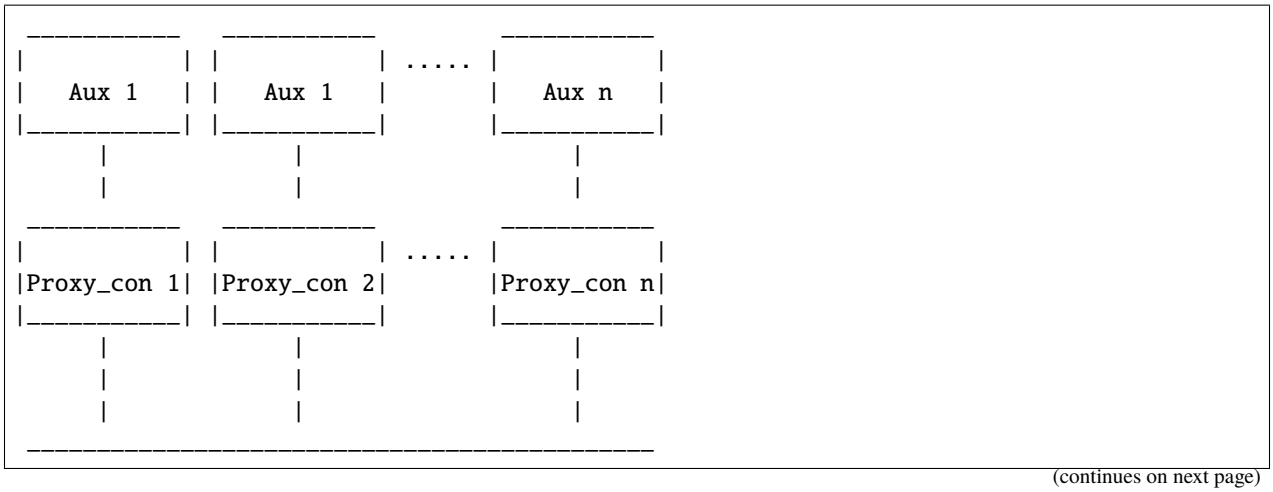
## proxy_auxiliary

## Proxy Auxiliary

**module** proxy_auxiliary

**synopsis** auxiliary use to connect multiple auxiliaries on a unique connector.

This auxiliary simply spread all commands and received messages to all connected auxiliaries. This auxiliary is only usable through proxy connector.

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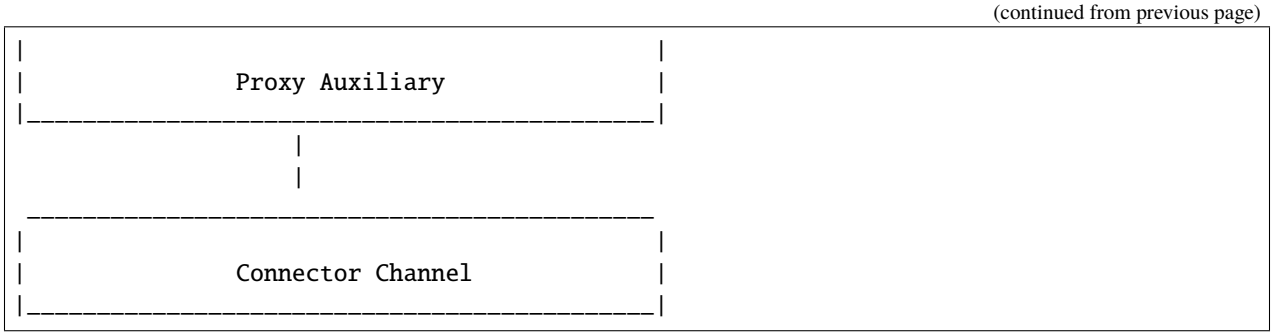


class pykiso.lib.auxiliaries.proxy_auxiliary.**ProxyAuxiliary**(*com*, *aux_list*, *activate_trace=False*, *trace_dir=None*, *trace_name=None*, ***kwargs*)

Proxy auxiliary for multi auxiliaries communication handling.

Initialize attributes.

**Parameters**

- **com** (*CChannel*) – Communication connector
- **aux_list** (List[str]) – list of auxiliary's alias
- **activate_trace** (bool) – log all received messages in a dedicated trace file or not
- **trace_dir** (Optional[str]) – where to place the trace
- **trace_name** (Optional[str]) – trace's file name

**get_proxy_con**(*aux_list*)

Retrieve all connector associated to all given existing Auxiliaries.

If auxiliary alias exists but auxiliary instance was not created yet, create it immediately using ConfigRegistry _aux_cache.

**Parameters** **aux_list** (List[str]) – list of auxiliary's alias

**Return type** Tuple

**Returns** tuple containing all connectors associated to all given auxiliaries

**run_command**(*conn*, **args*, ***kwargs*)

Transmit an incoming request from a linked proxy channel to the proxy auxiliary's channel.

**Parameters**

- **conn** (*CChannel*) – current proxy channel instance which the command comes from
- **args** (tuple) – postional arguments
- **args** – named arguments

**Return type** None

### record_auxiliary

Example can be found here *Passively record a channel*.

### Record Auxiliary

**module** record_auxiliary

**synopsis** Auxiliary used to record a connectors receive channel.

**class** pykiso.lib.auxiliaries.record_auxiliary.**RecordAuxiliary**(*com*, *is_active=False*, *timeout=0*, *log_folder_path=''*, *max_file_size=50000000*, *multiprocess=False*, *manual_start_record=False*, ***kwargs*)

Auxiliary used to record a connectors receive channel.

Constructor.

**Parameters**

- **com** (*CChannel*) – Communication connector to record
- **is_active** (bool) – Flag to actively poll receive channel in another thread
- **timeout** (float) – timeout for the receive channel
- **log_path** – path to the log folder
- **max_file_size** (int) – maximal size of the data string
- **multiprocess** (bool) – use a Process instead of a Thread for active polling. Note1: the data will automatically be saved Note2: if proxy usage, all connectors should be 'CCMpProxy' and 'processing' flag set to True
- **manual_start_record** (bool) – flag to not start recording on auxiliary creation

**clear_buffer**()

Clean the buffer that contain received messages.

**Return type** None

**dump_to_file**(*filename*, *mode='w+'*, *data=None*)

Writing data in file.

**Parameters**

- **filename** (str) – name of the file where data are saved
- **mode** (str) – modes of opening a file (eg: w, a)
- **data** (Optional[str]) – Optional write/append specific data to the file.

**Return type** bool

**Returns** True if the dumping has been successful, False else

**Raises** **FileNotFoundError** – if the given folder path is not a folder

**get_data**()

Return the entire log buffer content.

**Return type** str

**Returns** buffer content

`is_log_empty()`
Check if logs are available in the log buffer.

**Return type** bool

**Returns** True if log is empty, False either

`is_message_in_full_log(message)`
Check for a message being in log.

**Parameters** **message** (str) – message to check presence in logs.

**Returns** True if a message is in log, False otherwise

`is_message_in_log(message, from_cursor=True, set_cursor=True, display_log=False)`
Check for a message being in log.

**Parameters**

- **message** (str) – str message to check presence in logs.
- **from_cursor** (bool) – whether to get the logs from the last cursor position (True) or the full logs
- **set_cursor** (bool) – whether to update the cursor
- **display_log** (bool) – whether to log (via logging) the retrieved part or just return it

**Return type** bool

**Returns** True if a message is in log, False otherwise.

`new_log()`
Get new entries (after cursor position) from the log. This will set the cursor.

**Return type** str

**Returns** return log after cursor

`static parse_bytes(data)`
Decode the received bytes

**Parameters** **data** (bytes) – data to be decoded

**Return type** str

**Returns** data decoded

`previous_log()`
set cursor position to current position.

This will also display the logs from the last cursor position in the log.

**Return type** str

**Returns** log from the last current position

`receive()`
Open channel and actively poll the connectors receive channel. Stop and close connector when stop receive event has been set.

**Return type** None

`search_regex_current_string(regex)`

**Returns all occurrences found by the regex in the logs and** message received.

**Parameters** **regex** (str) – str regex to compare to logs

**Return type** Optional[List[str]]

**Returns** list of matches with regular expression in the current string

**search_regex_in_file**(*regex*, *filename*)
Returns all occurrences found by the regex in the logs and message received.

**Parameters**

- **regex** (str) – str regex to compare to logs
- **filename** (str) – filename of the desired file

**Return type** Optional[List[str]]

**Returns** list of matches with regular expression in the chosen file

**search_regex_in_folder**(*regex*)
Returns all occurrences found by the regex in the logs and message received.

**Parameters** **regex** (str) – str regex to compare to logs

**Return type** Optional[Dict[str, List[str]]]

**Returns** dictionary with filename and the list of matches with regular expression

**Raises** **FileNotFoundError** – if the given folder path is not a folder

**set_data**(*data*)
Add data to the already existing data string.

**Parameters** **data** (str) – the data to be write over the existing string

**Return type** None

**start_recording**()
Clear buffer and start recording.

**Return type** None

**stop_recording**()
Stop recording.

**Return type** None

**wait_for_message_in_log**(*message*, *timeout=10.0*, *interval=0.1*, *from_cursor=True*, *set_cursor=True*, *display_log=False*, *exception_on_failure=True*)
Poll log at every interval time, fail if messages has not shown up within the specified timeout and exception set to True, log an error otherwise.

**Parameters**

- **message** (str) – str message expected to show up
- **timeout** (float) – int timeout in seconds for the check
- **interval** (float) – int period in seconds for the log poll
- **from_cursor** (bool) – whether to get the logs from the last cursor position (True) or the full logs
- **set_cursor** (bool) – whether to update the cursor to the last log position

- **display_log** (bool) – whether to log (via logging) the retrieved part or just return it
- **exception_on_failure** (bool) – if set, raise a TimeoutError if the expected messages wasn't found in the logs. Otherwise, simply output a warning.

**Return type** bool

**Returns** True if the message have been received in the log, False otherwise

**Raises** **TimeoutError** – when a given message has not arrived in time

**class** pykiso.lib.auxiliaries.record_auxiliary.**StringIOHandler**(*multiprocess=False*)
Constructor

**Parameters** **multiprocess** (bool) – use a thread or multiprocessing lock.

**get_data**()
Get data from the string

**Return type** str

**Returns** data from the string

**set_data**(*data*)
Add data to the already existing data string

**Parameters** **data** (str) – the data to be write over the existing string

**Return type** None

### simulated_auxiliary

### Virtual DUT simulation package

**module** simulated_auxiliary

**synopsis** provide a simple interface to simulate a device under test

This auxiliary can be used as a simulated version of a device under test.

The intention is to set up a pair of CChannels like a pipe, for example a *CCUdpServer* and a *CCUdp* bound to the same address. One side of this pipe is then connected to this virtual auxiliary, the other one to a *real* auxiliary.

The SimulatedAuxiliary will then receive messages from the real auxiliary just like a proper TestApp on a DUT would and answer them according to a predefined playbook.

Each predefined playbooks are linked with real auxiliary received messages, using test case and test suite ids (see *simulation*). A so called playbook, is a basic list of different *Message* instances where the content is adapted to the current context under test (simulate a communication lost, a test case run failure…). (see *scenario*). In order to increase playbook configuration flexibility, predefined and reusable responses are located into *response_templates*.

| | |
|---|---|
| *pykiso.lib.auxiliaries.simulated_auxiliary.simulated_auxiliary* | Simulated Auxiliary |
| *pykiso.lib.auxiliaries.simulated_auxiliary.simulation* | Simulation |
| *pykiso.lib.auxiliaries.simulated_auxiliary.scenario* | Scenario |
| *pykiso.lib.auxiliaries.simulated_auxiliary.response_templates* | ResponseTemplates |

### Simulated Auxiliary

**module** simulated_auxiliary

**synopsis** auxiliary used to simulate a virtual Device Under Test(DUT)

**class** pykiso.lib.auxiliaries.simulated_auxiliary.simulated_auxiliary.**SimulatedAuxiliary**(**args*, ***kwargs*)

Custom auxiliary use to simulate a virtual DUT.

Initialize attributes.

**Parameters** **com** – configured channel

### Simulation

**module** simulation

**synopsis** map virtual DUT behavior with test case/suite id

**Warning:** Still under test

**class** pykiso.lib.auxiliaries.simulated_auxiliary.simulation.**Simulation**

Simulate a virtual DUT, by playing pre-defined scenario depending on test case and test suite id.

Initialize attributes and mapping.

**get_scenario**(*test_suite_id*, *test_case_id*)

Return the selected scenario mapped with the received test case and test suite id.

**Parameters**

- **test_suite_id** (int) – current test suite id
- **test_case_id** (int) – current test case id

**Return type** *Scenario*

**Returns** scenario instance containing all steps

**handle_default_response**()

Return a scenario to handle DUT default behavior.

**Return type** *Scenario*

**Returns** scenario instance containing all steps

**handle_ping_pong**()

Return a scenario to handle init ping pong exchange.

**Return type** *Scenario*

**Returns** scenario instance containing all steps

### Scenario

**module** scenario

**synopsis** base object used to create pre-defined virtual DUT scenario.

**Warning:** Still under test

class pykiso.lib.auxiliaries.simulated_auxiliary.scenario.**Scenario**(*initlist=None*)
Container used to create pre-defined virtual DUT scenario.

class pykiso.lib.auxiliaries.simulated_auxiliary.scenario.**TestScenario**
Encapsulate all possible test's scenarios.

class **VirtualTestCase**
Used to gather all virtual DUT test case scenarios based on their fixture level (setup, run, teardown).

class **Run**
Used to gather all possible scenarios linked to a test case run execution.

classmethod **handle_failed_report_run**()
Return a scenario to handle a complete test case with failed report at run phase.
**Return type** *Scenario*
**Returns** Scenario instance containing all steps

classmethod **handle_failed_report_run_with_log**()
Return a scenario to handle a complete test case with failed log and report at run phase.
**Return type** *Scenario*
**Returns** Scenario instance containing all steps

classmethod **handle_lost_communication_during_run_ack**()
Return a scenario to handle a complete test case with lost of communication during ACK to run Command.
**Return type** *Scenario*
**Returns** Scenario instance containing all steps

classmethod **handle_lost_communication_during_run_report**()
Return a scenario to handle a complete test case with lost of communication during report to run Command.
**Return type** *Scenario*
**Returns** Scenario instance containing all steps

classmethod **handle_not_implemented_report_run**()
Return a scenario to handle a complete test case with not implemented report at run phase.
**Return type** *Scenario*
**Returns** Scenario instance containing all steps

classmethod **handle_successful_report_run_with_log**()
Return a scenario to handle a complete test case with successful log and report at run phase.
**Return type** *Scenario*
**Returns** Scenario instance containing all steps

class **Setup**
Used to gather all possible scenarios linked to a test case setup execution.

classmethod **handle_failed_report_setup**()
Return a scenario to handle a complete test case with failed report at setup phase.
**Return type** *Scenario*

**Returns** Scenario instance containing all steps

**classmethod handle_lost_communication_during_setup_ack()**
Return a scenario to handle a complete test case with lost of communication during ACK to setup Command.
**Return type** *Scenario*
**Returns** Scenario instance containing all steps

**classmethod handle_lost_communication_during_setup_report()**
Return a scenario to handle a complete test case with lost of communication during report to setup Command.
**Return type** *Scenario*
**Returns** Scenario instance containing all steps

**classmethod handle_not_implemented_report_setup()**
Return a scenario to handle a complete test case with not implemented report at setup phase.
**Return type** *Scenario*
**Returns** Scenario instance containing all steps

**class Teardown**
Used to gather all possible scenarios linked to a test case teardown execution.

**classmethod handle_failed_report_teardown()**
Return a scenario to handle a complete test case with failed report at teardown phase.
**Return type** *Scenario*
**Returns** Scenario instance containing all steps

**classmethod handle_lost_communication_during_teardown_ack()**
Return a scenario to handle a complete test case with lost of communication during ACK to teardown Command.
**Return type** *Scenario*
**Returns** Scenario instance containing all steps

**classmethod handle_lost_communication_during_teardown_report()**
Return a scenario to handle a complete test case with lost of communication during report to teardown Command.
**Return type** *Scenario*
**Returns** Scenario instance containing all steps

**classmethod handle_not_implemented_report_teardown()**
Return a scenario to handle a complete test case with not implemented report at teardown phase.
**Return type** *Scenario*
**Returns** Scenario instance containing all steps

**class VirtualTestSuite**
Used to gather all virtual DUT test suite scenarios based on their fixture level (setup, teardown).

**class Setup**
Used to gather all possible scenarios linked to a test suite setup execution.

**classmethod handle_failed_report_setup()**
Return a scenario to handle a test suite setup with report failed.
**Return type** *Scenario*
**Returns** Scenario instance containing all steps

**classmethod handle_lost_communication_during_setup_ack()**
Return a scenario to handle a lost of communication during ACK to setup command.
**Return type** *Scenario*
**Returns** Scenario instance containing all steps

**classmethod handle_lost_communication_during_setup_report()**
Return a scenario to handle a lost of communication during report to setup command.
**Return type** *Scenario*
**Returns** Scenario instance containing all steps

**classmethod handle_not_implemented_report_setup()**
Return a scenario to handle a test suite setup with report not implemented.
**Return type** *Scenario*
**Returns** Scenario instance containing all steps

**class Teardown**
Used to gather all possible scenarios linked to a test suite teardown execution.

**classmethod handle_failed_report_teardown()**
Return a scenario to handle a test suite teardown with report failed.
**Return type** *Scenario*
**Returns** Scenario instance containing all steps

**classmethod handle_lost_communication_during_teardown_ack()**
Return a scenario to handle a lost of communication during ACK to teardown command.
**Return type** *Scenario*
**Returns** Scenario instance containing all steps

**classmethod handle_lost_communication_during_teardown_report()**
Return a scenario to handle a lost of communication during report to teardown command.
**Return type** *Scenario*
**Returns** Scenario instance containing all steps

**classmethod handle_not_implemented_report_teardown()**
Return a scenario to handle a test suite teardown with report not implemented.
**Return type** *Scenario*
**Returns** Scenario instance containing all steps

**classmethod handle_successful()**
Return a scenario to handle a complete successful test case exchange(TEST CASE setup->run->teardown).

**Return type** *Scenario*

**Returns** Scenario instance containing all steps

### ResponseTemplates

**module** response_templates

**synopsis** Used to create a set of predefined messages

**Warning:** Still under test

**class** pykiso.lib.auxiliaries.simulated_auxiliary.response_templates.**ResponseTemplates**
Used to create a set of predefined messages (ACK, NACK, REPORT ...).

**classmethod ack**(*msg*)
Return an acknowledgment message.

**Parameters** **msg** (*Message*) – current received message

**Return type** List[*Message*]

**Returns** list of Message

**classmethod ack_with_logs_and_report_nok**(*msg*)
Return an acknowledge message and log messages and report message with verdict failed + tlv part with failure reason.

**param msg** current received message

**return** list of Message

**Return type** List[*Message*]

**classmethod ack_with_logs_and_report_ok**(*msg*)
Return an acknowledge message and log messages and report message with verdict pass.

**param msg** current received message

**return** list of Message

**Return type** List[*Message*]

**classmethod ack_with_report_nok**(*msg*)
Return an acknowledgment message and a report message with verdict failed + tlv part with failure reason.

**Parameters** **msg** (*Message*) – current received message

**Return type** List[*Message*]

**Returns** list of Message

**classmethod ack_with_report_not_implemented**(*msg*)
Return an acknowledge message and a report message with verdict test not implemented.

**Parameters** **msg** (*Message*) – current received message

**Return type** List[*Message*]

**Returns** list of Message

**classmethod ack_with_report_ok**(*msg*)
Return an acknowledgment message and a report message with verdict pass.

**Parameters** **msg** (*Message*) – current received message

**Return type** List[*Message*]

**Returns** list of Message

**classmethod default**(*msg*)
handle default response, if not test case/suite run just return ACK message otherwise ACK + REPORT.

**Parameters** **msg** (*Message*) – current received message

**Return type** *Message*

**Returns** list of Message

**classmethod get_random_reason**()
Return tlv dictionary containing a random reason from pre-defined reason list.

**Parameters** **msg** – current received message

**Return type** dict

**Returns** tlv dictionary with failure reason

**classmethod nack_with_reason**(*msg*)
Return a NACK message with a tlv part containing the failure reason.

**Parameters** **msg** (*Message*) – current received message

**Return type** List[*Message*]

**Returns** list of Message

### UDS Auxiliary

### uds_auxiliary

**module** uds_auxiliary

**synopsis** Auxiliary used to handle Unified Diagnostic Service protocol

**class** pykiso.lib.auxiliaries.udsaux.uds_auxiliary.**UdsAuxiliary**(*com*, *config_ini_path=None*, *odx_file_path=None*, *request_id=None*, *response_id=None*, *tp_layer=None*, *uds_layer=None*, ***kwargs*)

Auxiliary used to handle the UDS protocol on client (tester) side.

Initialize attributes. :type com: *CChannel* :param com: communication channel connector. :type config_ini_path: Union[Path, str, None] :param config_ini_path: UDS parameter file. :type odx_file_path: Union[Path, str, None] :param odx_file_path: ecu diagnostic definition file. :type request_id: Optional[int] :param request_id: optional CAN ID used for sending messages. :type response_id: Optional[int] :param response_id: optional CAN ID used for receiving messages. :type tp_layer: Optional[dict] :param tp_layer: isotp configuration given at yaml level :type uds_layer: Optional[dict] :param uds_layer: uds configuration given at yaml level

**check_raw_response_negative**(*resp*)

Check if the response is negative, raise an error if not

**Parameters** **resp** (UdsResponse) – raw response of uds request

**Raises** **UnexpectedResponseError** – raised when the answer is not the expected one

**Return type** Optional[bool]

**Returns** True if response is negative

**check_raw_response_positive**(*resp*)

Check if the response is positive, raise an error if not

**Parameters** **resp** (UdsResponse) – raw response of uds request

**Raises** **UnexpectedResponseError** – raised when the answer is not the expected one

**Return type** Optional[bool]

**Returns** True if response is positive

**errors = <module 'pykiso.lib.auxiliaries.udsaux.common.uds_exceptions' from '/home/docs/checkouts/readthedocs.org/user_builds/kiso-testing/envs/0.19.2/lib/python3.7/site-packages/pykiso/lib/auxiliaries/udsaux/common/uds_exceptions.py'>**

**force_ecu_reset**()

Allow power reset of the component

**Return type** UdsResponse

**Returns** response of the force ecu reset request

hard_reset()
Allow power reset of the component

**Return type** Union[dict, UdsResponse]

**Returns** response of the hard reset request

read_data(*parameter*)
UDS config command that allow data reading

**Parameters** **parameter** (str) – data to be read

**Return type** Union[dict, bool, None]

**Returns** a dict with uds config response

send_uds_config(*msg_to_send*, *timeout_in_s=6*)
Send UDS config to the target ECU.

**Parameters**

- **msg_to_send** (dict) – uds config to be sent
- **timeout_in_s** (float) – not used

**Return type** Union[dict, bool]

**Returns** a dict containing the uds response, or True if a response is not expected and the command is properly sent otherwise False

send_uds_raw(*msg_to_send*, *timeout_in_s=6*, *response_required=True*)
Send a UDS diagnostic request to the target ECU and check response.

**Parameters**

- **msg_to_send** (Union[bytes, List[int], tuple]) – can uds raw bytes to be sent
- **timeout_in_s** (float) – not used, actual timeout in seconds for the response can be configured with the P2_CAN_Client parameter in the config.ini file (default value is 5s)
- **response_required** (bool) – Wait for a response if True

**Raises**

- **ResponseNotReceivedError** – raised when no answer has been received
- **Exception** – raised when the raw message could not be send properly

**Return type** Union[UdsResponse, bool]

**Returns** the raw uds response's bytes, or True if a response is not expected and the command is properly sent otherwise False

soft_reset()
Perform soft reset of the component, equivalent to a restart of application

**Return type** Union[dict, UdsResponse]

**Returns** response of the soft reset request

start_tester_present_sender(*period=4*)
Start to continuously send tester present messages via UDS

stop_tester_present_sender()
Stop to continuously send tester present messages via UDS

tester_present_sender(*period=4*)
Context manager that continuously sends tester present messages via UDS

**Parameters** **period** (int) – period in seconds to use for the cyclic sending of tester present

**Return type** Iterator[None]

**transmit**(*data*, *req_id*, *extended=False*)
Transmit a message through ITF connector. This method is a substitute to transmit method present in python-uds package.

**Parameters**

- **data** (bytes) – data to send
- **req_id** (int) – CAN message identifier
- **extended** (bool) – True if addressing mode is extended otherwise False

**Return type** None

**write_data**(*parameter*, *value*)
UDS config command that allow data writing

**Parameters**

- **parameter** (str) – data to be set
- **value** (Union[List[bytes], bytes]) – new content of the data

**Return type** Union[dict, bool, None]

**Returns** a dict with uds config response

### UDS Server Auxiliary

### UDS Auxiliary acting as a Server/ECU

**module** uds_server_auxiliary

**synopsis** Auxiliary used to handle Unified Diagnostic Service protocol as a Server. This auxiliary is meant to run in the background and replies to configured requests.

**class** pykiso.lib.auxiliaries.udsaux.uds_server_auxiliary.**UdsServerAuxiliary**(**args*, ***kwargs*)
Auxiliary used to handle the UDS protocol on server (ECU) side.

Initialize attributes.

**Parameters**

- **com** – communication channel connector.
- **config_ini_path** – uds parameters file.
- **request_id** – optional CAN ID used for sending messages.
- **response_id** – optional CAN ID used for receiving messages.
- **odx_file_path** – ecu diagnostic definition file.

**property callbacks**
Access the callback dictionary in a thread-safe way.

**Returns** the internal callbacks dictionary.

**static encode_stmin**(*stmin*)
Encode the provided minimum separation time according to the ISO TP specification.

**Parameters** **stmin** (float) – minimum separation time in ms.

**Raises** **ValueError** – if the provided value is not valid.

**Return type** int

**Returns** the encoded STmin to be sent in a flow control frame.

static **format_data**(*uds_data*)
Format UDS data as a list of integers to a hexadecimal string.

**Parameters** **uds_data** (List[int]) – UDS data as a list of integers.

**Return type** str

**Returns** the UDS data as a hexadecimal string.

**receive**()
Receive a message through ITF connector. Called inside a thread, this method is a substitute to the reception method used in the python-uds package.

**Return type** Optional[bytes]

**Returns** the received message or None.

**register_callback**(*request*, *response=None*, *response_data=None*, *data_length=None*, *callback=None*)
Register an automatic response to send if the specified request is received from the client.

The callback is stored inside the callbacks dictionary under the format **`{"0x2EC4": UdsCallback()}`_**, where the keys are case-sensitive and correspond to the registered requests.

**Parameters**

- **request** (Union[int, List[int], *UdsCallback*]) – UDS request to be responded to.
- **response** (Union[int, List[int], None]) – full UDS response to send. If not set, respond with a basic positive response with the specified response_data.
- **response_data** (Union[int, bytes, None]) – UDS data to send. If not set, respond with a basic positive response containing no data.
- **data_length** (Optional[int]) – optional length of the data to send if it is supposed to have a fixed length (zero-padded).
- **callback** (Optional[Callable]) – custom callback to register

**Return type** None

**send_flow_control**(*flow_status=0*, *block_size=0*, *stmin=0*)
Send an ISO TP flow control frame to the client.

**Parameters**

- **flow_status** (int) – status of the flow control, defaults to 0 (continue to send).
- **block_size** (int) – size of the data block to send, defaults to 0 (infinitely large).
- **stmin** (float) – minimum separation time between 2 consecutive frames in ms, defaults to 0 ms.

**Return type** None

**send_response**(*response_data*)
Encode and transmit a UDS response.

**Parameters** **response_data** (List[int]) – the UDS response to send.

**Return type** None

**services**
alias of uds.uds_config_tool.ISOStandard.ISOStandard.IsoServices

**transmit**(*data*, *req_id=None*, *extended=False*)
Pad and transmit a message through ITF connector. This method is also used as a substitute to the transmit method present in python-uds package.

**Parameters**

- **data** (List[int]) – data to send.
- **req_id** (Optional[int]) – CAN message identifier. If not set use the one configured.
- **extended** (bool) – True if addressing mode is extended otherwise False.

**Return type** None

**unregister_callback**(*request*)
Unregister previously registered callback.

The callback is stored inside the callbacks dictionary under the format **`{"0x2E01": UdsCallback()}`_**, where the keys are case-sensitive and correspond to the registered requests.

**Parameters** **request** (Union[str, int, List[int]]) – request for which the callback was registered as a string ("0x2E01"), an integer (0x2e01) or a list ([0x2e, 0x01]).

**Return type** None

### Helper classes for UDS callback registration

**module** uds_callback

**synopsis** This module defines classes for the definition of UDS callbacks to be registered by the **:py:class:`~pykiso.lib.auxiliaries.uds_aux.uds_server_auxiliary.UdsServerAuxiliary`_** along with callbacks for functional requests (TransferData service).

**class** pykiso.lib.auxiliaries.udsaux.common.uds_callback.**UdsCallback**(*request*, *response=None*, *response_data=None*, *data_length=None*, *callback=None*)
Class used to store information in order to configure and send a response to the specified UDS request.

**Parameters**

- **request** (*Union[int, List[int]]*) – request from the client that should be responded to.
- **response** (*Optional[Union[int, List[int]]]*) – full UDS response to send. If not set, respond with a basic positive response with the specified response_data.
- **response_data** (*Optional[Union[int, bytes]]*) – UDS data to send. If not set, respond with a basic positive response containing no data.
- **data_length** (*Optional[int]*) – optional length of the data to send in the response if the data has a fixed length (zero-padded).
- **callback** (*Optional[Callable[[List[int], UdsServerAuxiliary], None]]*) – custom callback function to register. The callback function must have two positional arguments: the received request as a list of integers and the UdsServerAuxiliary instance.

class pykiso.lib.auxiliaries.udsaux.common.uds_callback.**UdsDownloadCallback**(*request=IsoServices.RequestDownl*, *response=None*, *response_data=None*, *data_length=None*, *callback=None*, *stmin=0*)

UDS Callback for DownloadData handling on server-side.

In comparison to the base UdsCallback, this callback fixes the request tu 0x34 (RequestDownload) and the custom callback to execute in order to handle the data transfer.

**Parameters** **stmin** (*float*) – minimum separation time between two received consecutive frames.

**static get_first_frame_data_length**(*first_frame*)

Extract the expected data size to receive from a first frame (ISO TP) and the start index of the contained UDS request.

**Parameters** **first_frame** (List[int]) – received first frame.

**Return type** Tuple[int, int]

**Returns** tuple of two integers corresponding to the expected data length to receive and the resulting start index of the UDS request.

**static get_transfer_size**(*download_request*)

Extract the size of the data to download from the passed DownloadData request.

**Parameters** **download_request** (List[int]) – the received DownloadData request.

**Return type** int

**Returns** the expected download size.

**handle_data_download**(*download_request*, *aux*)

Handle a download request from the client.

This method handles the entire download functional unit composed of:

- sending the appropriate RequestDownload response to the received request
- **waiting for the initial TransferData request and sending the ISO TP** flow control frame
- receiving the data blocks until the transfer is finished
- sending the resulting TransferData positive response

**Parameters**

- **download_request** (*List[int]*) – DownloadData request received from the client.
- **aux** (UdsServerAuxiliary) – UdsServerAuxiliary instance used by the callback to handle data reception and transmission.

**Return type** None

**make_request_download_response**(*max_transfer_size=None*)

Build a positive response for a RequestDownload request based on the maximum transfer size.

**Parameters** **max_transfer_size** (Optional[int]) – maximum transfer size. If not set, use the default one configured inside the callback class (0xFFFF).

**Returns** the UDS RequestDownload positive response.

## 6.4 Message Protocol

### 6.4.1 pykiso Control Message Protocol

**module** message

**synopsis** Message that will be send though the different agents

**class** pykiso.message.**Message**(*msg_type=0*, *sub_type=0*, *error_code=0*, *test_suite=0*, *test_case=0*, *tlv_dict=None*)

A message who fit testApp protocol.

The created message is a tlv style message with the following format: TYPE: msg_type | message_token | sub_type | errorCode |

Create a generic message.

**Parameters**

- **msg_type** (*MessageType*) – Message type
- **sub_type** (*Message<MessageType>Type*) – Message sub-type
- **error_code** (*integer*) – Error value
- **test_suite** (*integer*) – Suite value
- **test_case** (*integer*) – Test value
- **tlv_dict** (*dict*) – Dictionary containing tlvs elements in the form {'type':'value', ...}

**check_if_ack_message_is_matching**(*ack_message*)

Check if the ack message was for this sent message.

**Parameters** **ack_message** (*Message*) – received acknowledge message

**Return type** bool

**Returns** True if message type and token are valid otherwise False

**generate_ack_message**(*ack_type*)

Generate acknowledgement to send out.

**Parameters** **ack_type** (int) – ack or nack

**Return type** Optional[*Message*]

**Returns** filled acknowledge message otherwise None

**classmethod get_crc**(*serialized_msg*, *crc_byte_size=2*)

Get the CRC checksum for a bytes message.

**Parameters**

- **serialized_msg** (bytes) – message used for the crc calculation
- **crc_byte_size** (int) – number of bytes dedicated for the crc

**Return type** int

**Returns** CRC checksum

**get_message_sub_type**()

Return actual message subtype.

**Return type** int

**get_message_tlv_dict**()
Return actual message type/length/value dictionary.

**Return type** dict

**get_message_token**()
Return actual message token.

**Return type** int

**get_message_type**()
Return actual message type.

**Return type** Union[int, *MessageType*]

**classmethod parse_packet**(*raw_packet*)
Factory function to create a Message object from raw data.

**Parameters** **raw_packet** (bytes) – array of a received message

**Return type** *Message*

**Returns** itself

**serialize**()
Serialize message into raw packet.

**Format: | msg_type (1b) | msg_token (1b) | sub_type (1b) | error_code (1b) |**

test_section (1b) | test_suite (1b) | test_case (1b) | payload_length (1b) |
tlv_type (1b) | tlv_size (1b) | ... | crc_checksum (2b)

**Return type** bytes

**Returns** bytes representing the Message object

**class** pykiso.message.**MessageAckType**(*value*)
List of possible received messages.

**class** pykiso.message.**MessageCommandType**(*value*)
List of commands allowed.

**class** pykiso.message.**MessageLogType**(*value*)
List of possible received log messages.

**class** pykiso.message.**MessageReportType**(*value*)
List of possible received messages.

**class** pykiso.message.**MessageType**(*value*)
List of messages allowed.

**class** pykiso.message.**TlvKnownTags**(*value*)
List of known / supported tags.

## 6.5 Import Magic

### 6.5.1 Auxiliary Interface Definition

**module** dynamic_loader

**synopsis** Import magic that enables aliased auxiliary loading in TestCases

class pykiso.test_setup.dynamic_loader.**DynamicImportLinker**
Public Interface of Import Magic.

initialises the Loaders, Finders and Caches, implements interfaces to install the magic and register the auxiliaries and connectors.

Initialize attributes.

**install**()
Install the import hooks with the system.

**provide_auxiliary**(*name*, *module*, *aux_cons=None*, ***config_params*)
Provide a auxiliary.

**Parameters**

- **name** (str) – the auxiliary alias
- **module** (str) – either 'python-file-path:Class' or 'module:Class' of the class we want to provide
- **aux_cons** – list of connectors this auxiliary has

**provide_connector**(*name*, *module*, ***config_params*)
Provide a connector.

**Parameters**

- **name** (str) – the connector alias
- **module** (str) – either 'python-file-path:Class' or 'module:Class' of the class we want to provide

**uninstall**()
Deregister the import hooks, close all running threads, delete all instances.

### 6.5.2 Config Registry

**module** config_registry

**synopsis** register auxiliaries and connectors to provide them for import.

class pykiso.test_setup.config_registry.**ConfigRegistry**
Register auxiliaries with connectors to provide systemwide import statements.

**classmethod delete_aux_con**()
Deregister the import hooks, close all running threads, delete all instances.

**Return type** None

**classmethod get_all_auxes**()
Return all auxiliaires instances and alias

**Return type** dict

**Returns** dictionary with alias as keys and instances as values

**classmethod get_aux_by_alias**(*alias*)
Return the associated auxiliary instance to the given alias.

**Parameters** **alias** (str) – auxiliary's alias

**Return type** Any

**Returns** auxiliary instance created by the dymanic loader

**classmethod get_aux_config**(*name*)
Return the registered auxiliary configuration based on his name.

**Parameters** **name** (str) – auxiliary alias

**Return type** dict

**Returns** auxiliary's configuration (yaml content)

**classmethod get_auxes_alias**()
return all created auxiliaries alias.

**Return type** list

**Returns** list containing all auxiliaries alias

**classmethod get_auxes_by_type**(*aux_type*)
Return all auxiliaries who match a specific type.

**Parameters** **aux_type** (Any) – auxiliary class type (DUTAuxiliary, CommunicationAuxiliary...)

**Return type** dict

**Returns** dictionary with alias as keys and instances as values

**classmethod register_aux_con**(*config*)
Create import hooks. Register auxiliaries and connectors.

**Parameters** **config** (dict) – dictionary containing yaml configuration content

**Return type** None

## 6.6 Test Suites

### 6.6.1 Test Suite

**module** test_suite

**synopsis** Create a generic test-suite based on the connected modules, and

gray test-suite for Message Protocol / TestApp usage.

**class** pykiso.test_coordinator.test_suite.**BaseTestSuite**(*test_suite_id*, *test_case_id*, *aux_list*, *setup_timeout*, *run_timeout*, *teardown_timeout*, *test_ids*, *tag*, *args*, *kwargs*)
Initialize generic test-case.

**Parameters**

- **test_suite_id** (int) – test suite identification number

- **test_case_id** (int) – test case identification number
- **aux_list** (Optional[List[*AuxiliaryInterface*]]) – list of used auxiliaries
- **setup_timeout** (Optional[int]) – maximum time (in seconds) used to wait for a report during setup execution
- **run_timeout** (Optional[int]) – maximum time (in seconds) used to wait for a report during test_run execution
- **teardown_timeout** (Optional[int]) – the maximum time (in seconds) used to wait for a report during teardown execution
- **test_ids** (Optional[dict]) – jama references to get the coverage eg: {"Component1": ["Req1", "Req2"], "Component2": ["Req3"]}
- **tag** (Optional[Dict[str, List[str]]]) – dictionary containing lists of variants and/or test levels when only a subset of tests needs to be executed

**cleanup_and_skip**(*aux*, *info_to_print*)

Cleanup auxiliary and log reasons.

**Parameters**

- **aux** (*AuxiliaryInterface*) – corresponding auxiliary to abort
- **info_to_print** (str) – A message you want to print while cleaning up the test

**class** pykiso.test_coordinator.test_suite.**BasicTestSuite**(*modules_to_add_dir*, *test_filter_pattern*, *test_suite_id*, *args*, *kwargs*)

Inherit from the unittest framework test-suite but build it for our integration tests.

Initialize our custom unittest-test-suite.

---

**Note:**

1. Will Load from the given path the integration test modules under test
2. Sort the given test case list by test suite/case id
3. Place Test suite setup and teardown respectively at top and bottom of test case list
4. Add sorted test case list to test suite

---

**check_suite_setup_failed**(*test*, *result*)

Check if the suite setup has failed and store failed suite id. Search in the global unittest result object, which save all the results of the tests performed up to that point, for a BasicTestSuiteSetup tests which has failed. If the suite setup has failed store the suite id.

**Parameters**

- **test** (BasicTest) – test to check
- **result** (*TestResult*) – unittest result object

**Return type** None

**run**(*result*, *debug=False*)

Override run method from unittest.suite.TestSuite. Added functionality: Skip suite tests if the parent test suite setup has failed.

**Parameters**

- **result** (*TestResult*) – unittest result storage

- **debug** (*bool*) – True to enter debug mode, defaults to False

**Return type** TestResult

**Returns** test suite result

class pykiso.test_coordinator.test_suite.**BasicTestSuiteSetup**(*test_suite_id*, *test_case_id*, *aux_list*, *setup_timeout*, *run_timeout*, *teardown_timeout*, *test_ids*, *tag*, *args*, *kwargs*)

Inherit from unittest testCase and represent setup fixture.

Initialize Message Protocol / TestApp test-case.

**Parameters**

- **test_suite_id** (int) – test suite identification number
- **test_case_id** (int) – test case identification number
- **aux_list** (Optional[List[*AuxiliaryInterface*]]) – list of used auxiliaries
- **setup_timeout** (Optional[int]) – maximum time (in seconds) used to wait for a report during setup execution
- **run_timeout** (Optional[int]) – maximum time (in seconds) used to wait for a report during test_run execution
- **teardown_timeout** (Optional[int]) – the maximum time (in seconds) used to wait for a report during teardown execution
- **test_ids** (Optional[dict]) – jama references to get the coverage eg: {"Component1": ["Req1", "Req2"], "Component2": ["Req3"]}
- **tag** (Optional[Dict[str, List[str]]]) – dictionary containing lists of variants and/or test levels when only a subset of tests needs to be executed

**test_suite_setUp**()

Test method for constructing the actual test suite.

class pykiso.test_coordinator.test_suite.**BasicTestSuiteTeardown**(*test_suite_id*, *test_case_id*, *aux_list*, *setup_timeout*, *run_timeout*, *teardown_timeout*, *test_ids*, *tag*, *args*, *kwargs*)

Inherit from unittest testCase and represent teardown fixture.

Initialize Message Protocol / TestApp test-case.

**Parameters**

- **test_suite_id** (int) – test suite identification number
- **test_case_id** (int) – test case identification number
- **aux_list** (Optional[List[*AuxiliaryInterface*]]) – list of used auxiliaries
- **setup_timeout** (Optional[int]) – maximum time (in seconds) used to wait for a report during setup execution
- **run_timeout** (Optional[int]) – maximum time (in seconds) used to wait for a report during test_run execution
- **teardown_timeout** (Optional[int]) – the maximum time (in seconds) used to wait for a report during teardown execution

- **test_ids** (Optional[dict]) – jama references to get the coverage eg: {"Component1": ["Req1", "Req2"], "Component2": ["Req3"]}
- **tag** (Optional[Dict[str, List[str]]]) – dictionary containing lists of variants and/or test levels when only a subset of tests needs to be executed

**test_suite_tearDown**()
Test method for deconstructing the actual test suite after testing it.

class pykiso.test_coordinator.test_suite.**RemoteTestSuiteSetup**(*test_suite_id*, *test_case_id*, *aux_list*, *setup_timeout*, *run_timeout*, *teardown_timeout*, *test_ids*, *tag*, *args*, *kwargs*)
Inherit from unittest testCase and represent setup fixture when Message Protocol / TestApp is used.

Initialize Message Protocol / TestApp test-case.

**Parameters**

- **test_suite_id** (int) – test suite identification number
- **test_case_id** (int) – test case identification number
- **aux_list** (Optional[List[*AuxiliaryInterface*]]) – list of used auxiliaries
- **setup_timeout** (Optional[int]) – maximum time (in seconds) used to wait for a report during setup execution
- **run_timeout** (Optional[int]) – maximum time (in seconds) used to wait for a report during test_run execution
- **teardown_timeout** (Optional[int]) – the maximum time (in seconds) used to wait for a report during teardown execution
- **test_ids** (Optional[dict]) – jama references to get the coverage eg: {"Component1": ["Req1", "Req2"], "Component2": ["Req3"]}
- **tag** (Optional[Dict[str, List[str]]]) – dictionary containing lists of variants and/or test levels when only a subset of tests needs to be executed

**test_suite_setUp**()
Test method for constructing the actual test suite.

class pykiso.test_coordinator.test_suite.**RemoteTestSuiteTeardown**(*test_suite_id*, *test_case_id*, *aux_list*, *setup_timeout*, *run_timeout*, *teardown_timeout*, *test_ids*, *tag*, *args*, *kwargs*)
Inherit from unittest testCase and represent teardown fixture when Message Protocol / TestApp is used.

Initialize Message Protocol / TestApp test-case.

**Parameters**

- **test_suite_id** (int) – test suite identification number
- **test_case_id** (int) – test case identification number
- **aux_list** (Optional[List[*AuxiliaryInterface*]]) – list of used auxiliaries
- **setup_timeout** (Optional[int]) – maximum time (in seconds) used to wait for a report during setup execution
- **run_timeout** (Optional[int]) – maximum time (in seconds) used to wait for a report during test_run execution

- **teardown_timeout** (Optional[int]) – the maximum time (in seconds) used to wait for a report during teardown execution
- **test_ids** (Optional[dict]) – jama references to get the coverage eg: {"Component1": ["Req1", "Req2"], "Component2": ["Req3"]}
- **tag** (Optional[Dict[str, List[str]]]) – dictionary containing lists of variants and/or test levels when only a subset of tests needs to be executed

**test_suite_tearDown**()
Test method for deconstructing the actual test suite after testing it.

## 6.7 Test Execution

### 6.7.1 Test Execution

**module** test_execution

**synopsis** Execute a test environment based on the supplied configuration.

---

**Note:**

1. Glob a list of test-suite folders
2. Generate a list of test-suites with a list of test-cases
3. Loop per suite
4. Gather result

---

**class** pykiso.test_coordinator.test_execution.**ExitCode**(*value*)
List of possible exit codes

**class** pykiso.test_coordinator.test_execution.**TestFilterPattern**(*test_file*, *test_class*, *test_case*)
Create new instance of TestFilterPattern(test_file, test_class, test_case)

**property test_case**
Alias for field number 2

**property test_class**
Alias for field number 1

**property test_file**
Alias for field number 0

pykiso.test_coordinator.test_execution.**apply_tag_filter**(*all_tests_to_run*, *usr_tags*)
Filter the test cases based on user tags. :type all_tests_to_run: TestSuite :param all_tests_to_run: a dict containing all testsuites and testcases :type usr_tags: Dict[str, List[str]] :param usr_tags: encapsulate user's variant choices

**Return type** None

pykiso.test_coordinator.test_execution.**apply_test_case_filter**(*all_tests_to_run*, *test_class_pattern*, *test_case_pattern*)
Apply a filter to run only test cases which matches given expression

**Parameters**

- **all_tests_to_run** (TestSuite) – a dict containing all testsuites and testcases
- **test_class_pattern** (str) – pattern to select test class as unix filename pattern
- **test_case_pattern** (str) – pattern to select test case as unix filename pattern

**Return type** TestSuite

**Returns** new test suite with filtered test cases

pykiso.test_coordinator.test_execution.**collect_test_suites**(*config_test_suite_list*, *test_filter_pattern=None*)

Collect and load all test suites defined in the test configuration.

**Parameters**

- **config_test_suite_list** (List[Dict[str, Union[str, int]]]) – list of dictionaries from the configuration file corresponding each to one test suite.
- **test_filter_pattern** (Optional[str]) – optional filter pattern to overwrite the one defined in the test suite configuration.

**Raises** **pykiso.TestCollectionError** – if any test case inside one of the configured test suites failed to be loaded.

**Return type** List[Optional[*BasicTestSuite*]]

**Returns** a list of all loaded test suites.

pykiso.test_coordinator.test_execution.**create_test_suite**(*test_suite_dict*)

create a test suite based on the config dict

**Parameters** **test_suite_dict** (Dict[str, Union[str, int]]) – dict created from config with keys 'suite_dir', 'test_filter_pattern', 'test_suite_id'

**Return type** *BasicTestSuite*

pykiso.test_coordinator.test_execution.**enable_step_report**(*all_tests_to_run*)

Decorate all assert method from Test-Case

This will allow to save the assert inputs in order to generate the step-report

**Parameters** **all_tests_to_run** (TestSuite) – a dict containing all testsuites and testcases

**Return type** None

pykiso.test_coordinator.test_execution.**execute**(*config*, *report_type='text'*, *user_tags=None*, *step_report=None*, *pattern_inject=None*, *failfast=False*)

Create test environment based on test configuration.

**Parameters**

- **config** (Dict[str, Any]) – dict from converted YAML config file
- **report_type** (str) – str to set the type of report wanted, i.e. test or junit
- **user_tags** (Optional[Dict[str, List[str]]]) – test case tags to execute
- **step_report** (Optional[Path]) – file path for the step report or None
- **pattern_inject** (Optional[str]) – optional pattern that will override test_filter_pattern for all suites. Used in test development to run specific tests.
- **failfast** (bool) – stop the test run on the first error or failure.

**Return type** int

**Returns** exit code corresponding to the result of the test execution (tests failed, unexpected exception, ...)

pykiso.test_coordinator.test_execution.**failure_and_error_handling**(*result*)
provide necessary information to Jenkins if an error occur during tests execution

**Parameters** **result** (TestResult) – encapsulate all test results from the current run

**Return type** int

**Returns** an ExitCode object

pykiso.test_coordinator.test_execution.**parse_test_selection_pattern**(*pattern*)
Parse test selection pattern from cli. For example: test_file.py::test_class::test_case

**Parameters** **pattern** (str) – test selection pattern

**Return type** *TestFilterPattern*

**Returns** pattern for file, class name and test case name

## 6.8 Test-Message Handling

### 6.8.1 Handle common communication with device under test

When using a Remote TestCase/TestSuite, the integration test framework handles internal messaging and control flow using a message format defined in pykiso.Message.

pykiso.test_message_handler defines the messaging protocol from a behavioral point of view.

**module** test_message_handler

**synopsis** default communication between TestManagement and DUT.

pykiso.test_coordinator.test_message_handler.**test_app_interaction**(*message_type*, *timeout_cmd=5*)
Handle test app basic interaction depending on the decorated method.

**Parameters**

- **message_type** (*MessageCommandType*) – message command sub-type (test case/suite run, setup, teardown....)
- **timeout_cmd** (int) – timeout in seconds for auxiliary run_command

**Return type** Callable

**Returns** inner decorator function

## 6.9 test xml result

### 6.9.1 test_xml_result

**module** test_xml_result

**synopsis** overwrite xmlrunner.result to be able to add additional data into the xml report.

class pykiso.test_coordinator.test_xml_result.**TestInfo**(*test_result*, *test_method*, *outcome=0*, *err=None*, *subTest=None*, *filename=None*, *lineno=None*, *doc=None*)

This class keeps useful information about the execution of a test method. Used by XmlTestResult

**Initialize the TestInfo class and append additional tag** that have to be stored for each test

**Parameters**

- **test_result** (_XMLTestResult) – test result class
- **test_method** – test method (dynamically created eg: test_case.MyTest2-1-2)
- **outcome** (int) – result of the test (SUCCESS, FAILURE, ERROR, SKIP)
- **err** – error cached during test
- **subTest** – optional, refer the test id and the test description
- **filename** (Optional[str]) – name of the file
- **lineno** (Optional[bool]) – store the test line number
- **doc** (Optional[str]) – additional documentation to store

class pykiso.test_coordinator.test_xml_result.**XmlTestResult**(*stream=<_io.TextIOWrapper name='<stderr>' mode='w' encoding='UTF-8'>*, *descriptions=True*, *verbosity=1*, *elapsed_times=True*, *properties=None*, *infoclass=<class 'pykiso.test_coordinator.test_xml_result.TestInfo'>*)

Test result class that can express test results in a XML report. Used by XMLTestRunner

Initialize the _XMLTestResult class.

**Parameters**

- **stream** (TextIOWrapper) – buffered text interface to a buffered raw stream
- **descriptions** (bool) – include description of the test
- **verbosity** (int) – print output into the console
- **elapsed_times** (bool) – include the time spend on the test
- **properties** – junit testsuite properties
- **infoclass** (_TestInfo) – class containing the test information

**report_testcase**(*xml_testsuite*, *xml_document*)

Appends a testcase section to the XML document.

CHAPTER

SEVEN

# ADDITIONAL TOOLS

## 7.1 Pykiso to Pytest

If you want to use as testing framework pytest while using the test-setup generator of pykiso (YAML-based generation of auxiliaries and communication channels), you can use the pykiso_to_pytest command to convert existing pykiso yaml configuration into a pytest fixture.

```
pykitest examples/dummy.yaml
```

Example can be found inside examples/pytest.

## 7.2 Show and export test suite tags

The `pykiso-tags` CLI utility takes as input YAML configuration files and passively loads all the specified test suites in order to create a test information table.

This table contains the number of test cases that will be run when providing this configuration file to pykiso and the test tags that are specified in each test suite.

Another options can be specified and the table can be exported to various formats. See:

```
pykiso-tags --help
```

A minimal invocation of the tool would be:

```
pykiso-tags -c kiso-testing/examples/dummy.yaml
```

Which results in the following output:

```
Start analyzing provided configuration file...

All valid configuration files have been processed successfully:


| File name   |   Number of tests | variant   | branch_level   |

| dummy.yaml  |                 7 | variant1  | daily          |
|             |                   | variant3  | nightly        |
```

**Note:** If an environment variable without a default value is not found, the tool will skip the configuration file. Also, configuration files for Robot framework tests are not supported yet.

CHAPTER

EIGHT

# ROBOT FRAMEWORK INTEGRATION

Integration Test Framework auxiliary<->connector mechanism is usable with Robot framework. In order to achieve it, extra plugins have been developed :

- RobotLoader : handle the import magic mechanism
- RobotComAux : keyword declaration for existing CommunicationAuxiliary

**Note:** See Robot framework regarding details about Robot keywords, cli...

## 8.1 How to integrate

To bind ITF with Robot framework, the RobotLoader library has to be used in order to correctly create all auxiliaries and connectors (using the "usual" yaml configuration style). This step is mandatory, and could be done using the "Library" keyword and RobotLoader install/uninstall function. For example, inside a test suite using "Suite Setup" and "Suite Teardown":

```
*** Settings ***
Documentation   How to handle auxiliaries and connectors creation using Robot framework

Library    pykiso.lib.robot_framework.loader.RobotLoader    robot_com_aux.yaml    WITH␣
↪NAME    Loader

Suite Setup       Loader.install
Suite Teardown    Loader.uninstall
```

## 8.2 Ready to Use Auxiliaries

### 8.2.1 Communication Auxiliary

This plugin only contains two keywords "Send message" and "Receive message". The first one simply sends raw bytes using the associated connector and the second one returns one received message (raw form).

See below a complete example of the Robot Communication Auxiliary plugin:

```
*** Settings ***
Documentation   Robot framework Demo for communication auxiliary implementation
```

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```
Library    pykiso.lib.robot_framework.communication_auxiliary.CommunicationAuxiliary  ␣
↪WITH NAME    ComAux

*** Keywords ***

send raw message
    [Arguments]  ${raw_msg}  ${aux}
    ${is_executed}=    ComAux.Send message    ${raw_msg}    ${aux}
    [return]  ${is_executed}

get raw message
    [Arguments]  ${aux}  ${blocking}  ${timeout}
    ${msg}  ${source}=    ComAux.Receive message    ${aux}    ${blocking}    ${timeout}
    [return]  ${msg}  ${source}

*** Test Cases ***

Test send raw bytes using keywords
    [Documentation]    Simply send raw bytes over configured channel
    ...                using defined keywords

    ${state}  send raw message    \x01\x02\x03    aux1

    Log    ${state}

    Should Be Equal    ${state}    ${TRUE}

    ${msg}  ${source}  get raw message    aux1    ${TRUE}    0.5

    Log    ${msg}

Test send raw bytes
    [Documentation]    Simply send raw bytes over configured channel
    ...                using communication auxiliary methods directly

    ${state} =  Send message    \x04\x05\x06    aux2

    Log    ${state}

    Should Be Equal    ${state}    ${TRUE}

    ${msg}  ${source} =  Receive message    aux2    ${FALSE}    0.5

    Log    ${msg}
```

### 8.2.2 Dut Auxiliary

This plugin can be used to control the ITF TestApp on the DUT.

See below an example of the Robot Dut Auxiliary plugin:

```
*** Settings ***
Documentation   Test demo with RobotFramework and ITF TestApp

Library    pykiso.lib.robot_framework.dut_auxiliary.DUTAuxiliary    WITH NAME    DutAux

Suite Setup       Setup Aux

*** Keywords ***
Setup Aux
    @{auxiliaries} =    Create List  aux1  aux2
    Set Suite Variable  @{suite_auxiliaries}  @{auxiliaries}

*** Variables ***

*** Test Cases ***

Test TEST_SUITE_SETUP
    [Documentation]   Setup test suite on DUT
    Test App    TEST_SUITE_SETUP  1  1  ${suite_auxiliaries}

Test TEST_SECTION_RUN
    [Documentation]   Run test section on DUT
    Test App    TEST_SECTION_RUN  1  1  ${suite_auxiliaries}

Test TEST_CASE_SETUP
    [Documentation]   Setup test case on DUT
    Test App    TEST_CASE_SETUP  1  1  ${suite_auxiliaries}

Test TEST_CASE_RUN
    [Documentation]   Run test case on DUT
    Test App    TEST_CASE_RUN  1  1  ${suite_auxiliaries}

Test TEST_CASE_TEARDOWN
    [Documentation]   Teardown test case on DUT
    Test App    TEST_CASE_TEARDOWN  1  1  ${suite_auxiliaries}

Test TEST_SUITE_TEARDOWN
    [Documentation]   Teardown test suite on DUT
    Test App    TEST_SUITE_TEARDOWN  1  1  ${suite_auxiliaries}
```

### 8.2.3 Proxy Auxiliary

This robot plugin only contains two keywords : Suspend and Resume.

See below example :

```
*** Settings ***
Documentation   Robot framework Demo for proxy auxiliary implementation

Library    pykiso.lib.robot_framework.proxy_auxiliary.ProxyAuxiliary    WITH NAME    ␣
↪ProxyAux


*** Test Cases ***

Stop auxiliary run
    [Documentation]    Simply stop the current running auxiliary

    Suspend    ProxyAux

Resume auxiliary run
    [Documentation]    Simply resume the current running auxiliary

    Resume    ProxyAux
```

### 8.2.4 Instrument Control Auxiliary

As the "ITF" instrument control auxiliary, the robot version integrate exactly the same user's interface.

**Note:** All return types between "ITF" and "Robot" auxiliary's version stay identical!

Please find below a complete correlation table:

| ITF method | robot equivalent | Parameter 1 | Parameter 2 | Parameter 3 |
|---|---|---|---|---|
| write | Write | command | aux alias | validation |
| read | Read | aux alias | | |
| query | Query | command | aux alias | |
| get_identification | Get identification | aux alias | | |
| get_status_byte | Get status byte | aux alias | | |
| get_all_errors | Get all errors | aux alias | | |
| reset | Reset | aux alias | | |
| self_test | Self test | aux alias | | |
| get_remote_control_state | Get remote control state | aux alias | | |
| set_remote_control_on | Set remote control on | aux alias | | |
| set_remote_control_off | Set remote control off | aux alias | | |
| get_output_channel | Get output channel | aux alias | | |
| set_output_channel | Set output channel | channel | aux alias | |
| get_output_state | Get output state | aux alias | | |
| enable_output | Enable output | aux alias | | |
| disable_output | Disable output | aux alias | | |

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Table 1 – continued from previous page

| ITF method | robot equivalent | Parameter 1 | Parameter 2 | Parameter 3 |
|---|---|---|---|---|
| get_nominal_voltage | Get nominal voltage | aux alias | | |
| get_nominal_current | Get nominal current | aux alias | | |
| get_nominal_power | Get nominal power | aux alias | | |
| measure_voltage | Measure voltage | aux alias | | |
| measure_current | Measure current | aux alias | | |
| measure_power | Measure power | aux alias | | |
| get_target_voltage | Get target voltage | aux alias | | |
| get_target_current | Get target current | aux alias | | |
| get_target_power | Get target power | aux alias | | |
| set_target_voltage | Set target voltage | voltage | aux alias | |
| set_target_current | Set target current | current | aux alias | |
| set_target_power | Set target power | power | aux alias | |
| get_voltage_limit_low | Get voltage limit low | aux alias | | |
| get_voltage_limit_high | Get voltage limit high | aux alias | | |
| get_current_limit_low | Get current limit low | aux alias | | |
| get_current_limit_high | Get current limit high | aux alias | | |
| get_power_limit_high | Get power limit high | aux alias | | |
| set_voltage_limit_low | Set voltage limit low | voltage limit | aux alias | |
| set_voltage_limit_high | Set voltage limit high | voltage limit | aux alias | |
| set_current_limit_low | Set current limit low | current limit | aux alias | |
| set_current_limit_high | Set current limit high | current limit | aux alias | |
| set_power_limit_high | Set power limit high | power limit | aux alias | |

To run the available example:

```
cd examples
robot robot_test_suite/test_instrument
```

**Note:** A script demo with all available keywords is under examples/robot_test_suite/test_instrument and yaml see robot_inst_aux.yaml!

### 8.2.5 Acroname Auxiliary

This plugin can be used to control a acroname usb hub.

Find below an example with all available features:

```
*** Settings ***
Documentation   Robot framework Demo for acroname auxiliary implementation

Library    pykiso.lib.robot_framework.acroname_auxiliary.AcronameAuxiliary    WITH NAME␣
↪  AcroAux

*** Variables ***
${NO_ERROR} =    ${0}

*** Test Cases ***

```

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```
Disable / Enable USB Ports
    [Documentation]    Disable and Enable USB Ports

    Log    Disable all Ports

    FOR    ${index}    IN RANGE    0    4
        Log    Disable USB port ${index}
        ${state}  Set port disable    acroname_aux    ${index}
        Should Be Equal    ${state}    ${NO_ERROR}
    END

    Sleep    1s

    FOR    ${index}    IN RANGE    0    4
        Log    Enable USB port ${index}
        ${state}  Set port disable    acroname_aux    ${index}
        Should Be Equal    ${state}    ${NO_ERROR}
    END

    Sleep    1s

Get Port Current
    [Documentation]    Read usb port current

    Log    Read port current

    FOR    ${index}    IN RANGE    0    4
        ${current}  Get port current    acroname_aux    ${index}    mA
        Log    Current on port ${index} is ${current} mA
    END

    Sleep    1s

Get Port Voltage
    [Documentation]    Read usb port voltage

    Log    Read port voltage

    FOR    ${index}    IN RANGE    0    4
        ${voltage}  Get port voltage    acroname_aux    ${index}    mV
        Log    Voltage on port ${index} is ${voltage} mV
    END

    Sleep    1s

Set Port Current Limit
    [Documentation]    Set usb port current

    Log    Read port current

    FOR    ${index}    IN RANGE    0    4
        Log    Set port current on port ${index} to 500 mA
```

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```
        ${state}  Set port current limit    acroname_aux    ${index}    ${500}    mA
        Should Be Equal   ${state}    ${NO_ERROR}
    END

    Sleep    1s

Get Port Current Limit
    [Documentation]    Get usb port current limit

    Log    Read port current

    FOR    ${index}    IN RANGE    0    4
        ${current}  Get port current limit    acroname_aux    ${index}    mA
        Log    Port limit on port ${index} is ${current} mA
    END

    Sleep    1s

Set Port Current Limit to max
    [Documentation]    Set usb port current limit

    Log    Read port current

    FOR    ${index}    IN RANGE    0    4
        Log    Set port current on port ${index} to 1500 mA
        ${state}  Set port current limit    acroname_aux    ${index}    ${1500}    mA
        Should Be Equal   ${state}    ${NO_ERROR}
    END

    Sleep    1s
```

To run the available example:

```
cd examples
robot robot_test_suite/test_instrument
```

### 8.2.6 Record Auxiliary

Auxiliary used to record a connectors receive channel which are configured in the yaml config. The library needs then only to be loaded. See example below:

config.yaml:

```yaml
auxiliaries:
  record_aux:
    connectors:
      com: rtt_channel
    config:
      # When is_active is set, it actively polls the connector. It demands if
      # the used connector needs to be polled actively.
      is_active: False # False because rtt_channel has its own receive thread
```

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```
    type: pykiso.lib.auxiliaries.record_auxiliary:RecordAuxiliary

connectors:
  rtt_channel:
    config:
      chip_name: "STM12345678"
      speed: 4000
      block_address: 0x12345678
      verbose: True
      tx_buffer_idx: 1
      rx_buffer_idx: 1
      # Path relative to this yaml where the RTT logs should be written to.
      # Creates a file named rtt.log
      rtt_log_path: ./
      # RTT channel from where the RTT logs should be read
      rtt_log_buffer_idx: 0
      # Manage RTT log CPU impact by setting logger speed. eg: 100% CPU load
      # default: 1000 lines/s
      rtt_log_speed: null
    type: pykiso.lib.connectors.cc_rtt_segger:CCRttSegger

test_suite_list:
- suite_dir: test_record
  test_filter_pattern: '*.py'
  test_suite_id: 1
```

Robot file:

```
*** Settings ***
Documentation   Robot framework Demo for record auxiliary

# Library import will start recording
Library    pykiso.lib.robot_framework.record_auxiliary.RecordAuxiliary

*** Keywords ***

*** Test Cases ***

Test Something
    [Documentation]    Record channel in the background

    Sleep    5s
```

To run the available example:

```
cd examples
robot robot_test_suite/test_record/
```

### 8.2.7 UDS Auxiliary

To run the example:

```yaml
auxiliaries:
  uds_aux:
    connectors:
        com: can_channel
    config:
      odx_file_path: null
      request_id : 0x123
      response_id : 0x321
      uds_layer:
        transport_protocol: 'CAN'
        p2_can_client: 5
        p2_can_server: 1
      tp_layer:
        req_id: 0xAB
        res_id: 0xAC
        addressing_type: 'NORMAL'
        n_sa: 0xFF
        n_ta: 0xFF
        n_ae: 0xFF
        m_type: 'DIAGNOSTICS'
        discard_neg_resp: False
    type: pykiso.lib.auxiliaries.udsaux.uds_auxiliary:UdsAuxiliary
connectors:
  can_channel:
    config:
      interface : 'pcan'
      channel: 'PCAN_USBBUS1'
      state: 'ACTIVE'
    type: pykiso.lib.connectors.cc_pcan_can:CCPCanCan
```

As the "ITF" uds auxiliary, the robot version integrate exactly the same user's interface.

---

**Note:** All return types between "ITF" and "Robot" auxiliary's version stay identical! Only "Send uds raw" keywords return a list instead of bytes!

---

Please find below a complete correlation table:

| ITF method | robot equivalent | Parameter 1 | Parameter 2 | Parameter 3 | Parameter 4 |
|---|---|---|---|---|---|
| send_uds_raw | Send uds raw | message | aux alias | timeout | |
| send_uds_config | Send uds config | message | aux alias | timeout | |

Robot file:

```
*** Settings ***
Documentation   Robot framework Demo for uds auxiliary implementation
Library    pykiso.lib.robot_framework.uds_auxiliary.UdsAuxiliary    WITH NAME    UdsAux
Library    Collections

```

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```
*** Test Cases ***

Go in default session
    [Documentation]    Send diagnostic session control request session
    ...                default using Send uds raw

    ${response} =  Send uds raw    \x10\x01    uds_aux

    Log  ${response}

Use tester present sender
    [Documentation]    If no communication is exchanged with the client for more than 5
    ...                seconds the control unit automatically exits the current session and
    ...                returns to the "Default Session" back, and might go to sleep mode.
    ...
    ...                To avoid this issue, if test steps take too long between uds commands,
    ...                the tester present sender can be used. It will send
    ...                at a defined period a Tester Present, to signal to the device that
    ...                the client is still present.

    Start tester present with    1  seconds    uds_aux
    ${response} =  Send uds raw    \x10\x03    uds_aux
    Stop tester present
```

To run the available example:

```
cd examples
robot robot_test_suite/test_uds/
```

## 8.3 Robot Framework API Library Documentation

### 8.3.1 Dynamic Loader plugin

**module** loader

**synopsis** implementation of existing magic import mechanism from ITF for Robot framework usage.

**class** pykiso.lib.robot_framework.loader.**RobotLoader**(*config_file*)

Robot framework plugin for ITF magic import mechanism.

Initialize attributes.

:param config_file : yaml configuration file path

**install**()

Provide, create and import auxiliaires/connectors present within yaml configuration file.

**Raises** re-raise the caught exception (Exception level)

**Return type** None

**uninstall**()
Uninstall all created instances of auxiliaires/connectors.

**Raises** re-raise the caught exception (Exception level)

**Return type** None

### 8.3.2 Auxiliary interface

**module** aux_interface

**synopsis** Simply stored common methods for auxiliary's when ITF is used with Robot framework.

**class** pykiso.lib.robot_framework.aux_interface.**RobotAuxInterface**(*aux_type*)
Common interface for all Robot auxiliary.

Initialize attributes.

**Parameters** **aux_type** (*AuxiliaryInterface*) – auxiliary's class

### 8.3.3 Communication auxiliary plugin

**module** communication_auxiliary

**synopsis** implementation of existing CommunicationAuxiliary for Robot framework usage.

**class** pykiso.lib.robot_framework.communication_auxiliary.**CommunicationAuxiliary**
Robot framework plugin for CommunicationAuxiliary.

Initialize attributes.

**clear_buffer**(*aux_alias*)
Clear buffer from old stacked objects

**Return type** None

**receive_message**(*aux_alias*, *blocking=True*, *timeout_in_s=None*)
Return a raw received message from the queue.

**Parameters**

- **aux_alias** (str) – auxiliary's alias
- **blocking** (bool) – wait for message till timeout elapses?
- **timeout_in_s** (Optional[float]) – maximum time in second to wait for a response

**Return type** Union[list, Tuple[list, int]]

**Returns** raw message and source (return type could be different depending on the associated channel)

**send_message**(*raw_msg*, *aux_alias*)
Send a raw message via the communication channel.

**Parameters**

- **aux_alias** (str) – auxiliary's alias
- **raw_msg** (bytes) – message to send

**Return type** bool

**Returns** state representing the send message command completion

**start_recording_received_messages**()
Start recording received com_aux messages

**Return type** None

**stop_recording_received_messages**()
Stop recording received com_aux messages

**Return type** None

### 8.3.4 Testapp binding

**module** dut_auxiliary

**synopsis** implementation of existing DUTAuxiliary for Robot framework usage.

**class** pykiso.lib.robot_framework.dut_auxiliary.**DUTAuxiliary**
Robot library to control the TestApp on the DUT

Initialize attributes.

**test_app_run**(*command_type*, *test_suite_id*, *test_case_id*, *aux_list*)
Execute the corresponding test fixture using Test App communication protocol.

**Parameters**

- **command_type** (str) – message command sub-type
- **test_suite_id** (int) – select test suite id on dut
- **test_case_id** (int) – select test case id on dut
- **aux_list** (List[str]) – List of selected auxiliary

**Raises**

- **TypeError** – if the given command type doesn't exist
- **Assertion** – if an aknowledgment is not received or the report status is failed.

**Return type** None

### 8.3.5 Proxy auxiliary plugin

**module** proxy_auxiliary

**synopsis** implementation of existing ProxyAuxiliary for Robot framework usage.

**class** pykiso.lib.robot_framework.proxy_auxiliary.**MpProxyAuxiliary**
Robot framework plugin for MpProxyAuxiliary.

Initialize attributes.

**resume**(*aux_alias*)
Resume given auxiliary's run.

**Parameters** **aux_alias** (str) – auxiliary's alias

**Return type** None

**suspend**(*aux_alias*)
Suspend given auxiliary's run.

**Parameters** **aux_alias** (str) – auxiliary's alias

**Return type** None

class pykiso.lib.robot_framework.proxy_auxiliary.**ProxyAuxiliary**
Robot framework plugin for ProxyAuxiliary.

Initialize attributes.

**resume**(*aux_alias*)
Resume given auxiliary's run.

**Parameters** **aux_alias** (str) – auxiliary's alias

**Return type** None

**suspend**(*aux_alias*)
Suspend given auxiliary's run.

**Parameters** **aux_alias** (str) – auxiliary's alias

**Return type** None

### 8.3.6 Instrument control auxiliary plugin

**module** instrument_control_auxiliary

**synopsis** implementation of existing InstrumentControlAuxiliary for Robot framework usage.

class pykiso.lib.robot_framework.instrument_control_auxiliary.**InstrumentControlAuxiliary**
Robot framework plugin for InstrumentControlAuxiliary.

Initialize attributes.

**disable_output**(*aux_alias*)
Disable output on the currently selected output channel of an instrument.

**Parameters** **aux_alias** (str) – auxiliary's alias

**Return type** str

**Returns** the writing operation's status code

**enable_output**(*aux_alias*)
Enable output on the currently selected output channel of an instrument.

**Parameters** **aux_alias** (str) – auxiliary's alias

**Return type** str

**Returns** the writing operation's status code

**get_all_errors**(*aux_alias*)
Get all errors of an instrument.

**Parameters** **aux_alias** (str) – auxiliary's alias

return: list of off errors

**Return type** str

**get_current_limit_high**(*aux_alias*)
Returns the current upper limit (in V) of an instrument.

**Parameters** **aux_alias** (str) – auxiliary's alias

**Return type** str

**Returns** the query's response message

get_current_limit_low(*aux_alias*)
Returns the current lower limit (in V) of an instrument.

**Parameters** **aux_alias** (str) – auxiliary's alias

**Return type** str

**Returns** the query's response message

get_identification(*aux_alias*)
Get the identification information of an instrument.

**Parameters** **aux_alias** (str) – auxiliary's alias

**Return type** str

**Returns** the instrument's identification information

get_nominal_current(*aux_alias*)
Query the nominal current of an instrument on the selected channel (in A)

**Parameters** **aux_alias** (str) – auxiliary's alias

**Return type** str

**Returns** the nominal current

get_nominal_power(*aux_alias*)
Query the nominal power of an instrument on the selected channel (in W).

**Parameters** **aux_alias** (str) – auxiliary's alias

**Return type** str

**Returns** the nominal power

get_nominal_voltage(*aux_alias*)
Query the nominal voltage of an instrument on the selected channel (in V).

**Parameters** **aux_alias** (str) – auxiliary's alias

**Return type** str

**Returns** the nominal voltage

get_output_channel(*aux_alias*)
Get the currently selected output channel of an instrument.

**Parameters** **aux_alias** (str) – auxiliary's alias

**Return type** str

**Returns** the currently selected output channel

get_output_state(*aux_alias*)
Get the output status (ON or OFF, enabled or disabled) of the currently selected channel of an instrument.

**Parameters** **aux_alias** (str) – auxiliary's alias

**Return type** str

**Returns** the output state (ON or OFF)

get_power_limit_high(*aux_alias*)
Returns the power upper limit (in W) of an instrument.

**Parameters** **aux_alias** (str) – auxiliary's alias

**Return type** str

**Returns** the query's response message

`get_remote_control_state`(*aux_alias*)
Get the remote control mode (ON or OFF) of an instrument.

**Parameters** **aux_alias** (str) – auxiliary's alias

**Return type** str

**Returns** the remote control state

`get_status_byte`(*aux_alias*)
Get the status byte of an instrument.

**Parameters** **aux_alias** (str) – auxiliary's alias

**Return type** str

**Returns** the intrument's status byte

`get_target_current`(*aux_alias*)
Get the desired output current (in A) of an instrument.

**Parameters** **aux_alias** (str) – auxiliary's alias

**Return type** str

**Returns** the target current

`get_target_power`(*aux_alias*)
Get the desired output power (in W) of an instrument.

**Parameters** **aux_alias** (str) – auxiliary's alias

**Return type** str

**Returns** the target power

`get_target_voltage`(*aux_alias*)
Get the desired output voltage (in V) of an instrument.

**Parameters** **aux_alias** (str) – auxiliary's alias

**Return type** str

**Returns** the target voltage

`get_voltage_limit_high`(*aux_alias*)
Returns the voltage upper limit (in V) of an instrument.

**Parameters** **aux_alias** (str) – auxiliary's alias

**Return type** str

**Returns** the query's response message

`get_voltage_limit_low`(*aux_alias*)
Returns the voltage lower limit (in V) of an instrument.

**Parameters** **aux_alias** (str) – auxiliary's alias

**Return type** str

**Returns** the query's response message

`measure_current`(*aux_alias*)
Return the measured output current of an instrument (in A).

**Parameters** **aux_alias** (str) – auxiliary's alias

**Return type** str

**Returns** the measured current

**measure_power**(*aux_alias*)
Return the measured output power of an instrument (in W).

**Parameters** **aux_alias** (str) – auxiliary's alias

**Return type** str

**Returns** the measured power

**measure_voltage**(*aux_alias*)
Return the measured output voltage of an instrument (in V).

**Parameters** **aux_alias** (str) – auxiliary's alias

**Return type** str

**Returns** the measured voltage

**query**(*query_command*, *aux_alias*)
Send a query request to the instrument.

**Parameters**

- **query_command** (str) – query command to send
- **aux_alias** (str) – auxiliary's alias

**Return type** str

**Returns** Response message, None if the request expired with a timeout.

**read**(*aux_alias*)
Send a read request to the instrument.

**Parameters** **aux_alias** (str) – auxiliary's alias

**Return type** str

**Returns** Response message, None if the request expired with a timeout.

**reset**(*aux_alias*)
Reset an instrument.

**Parameters** **aux_alias** (str) – auxiliary's alias

**Return type** str

**Returns** NO_VALIDATION status code

**self_test**(*aux_alias*)
Performs a self-test of an instrument.

**Parameters** **aux_alias** (str) – auxiliary's alias

**Return type** str

**Returns** the query's response message

**set_current_limit_high**(*limit_value*, *aux_alias*)
Set the current upper limit (in A) of an instrument.

**Parameters**

- **limit_value** (float) – limit value to be set on the instrument

- **aux_alias** (str) – auxiliary's alias

**Return type** str

**Returns** the writing operation's status code

**set_current_limit_low**(*limit_value*, *aux_alias*)
Set the current lower limit (in A) of an instrument.

**Parameters**

- **limit_value** (float) – limit value to be set on the instrument
- **aux_alias** (str) – auxiliary's alias

**Return type** str

**Returns** the writing operation's status code

**set_output_channel**(*channel*, *aux_alias*)
Set the output channel of an instrument.

**Parameters**

- **channel** (int) – the output channel to select on the instrument
- **aux_alias** (str) – auxiliary's alias

**Return type** str

**Returns** the writing operation's status code

**set_power_limit_high**(*limit_value*, *aux_alias*)
Set the power upper limit (in W) of an instrument.

**Parameters**

- **limit_value** (float) – limit value to be set on the instrument
- **aux_alias** (str) – auxiliary's alias

**Return type** str

**Returns** the writing operation's status code

**set_remote_control_off**(*aux_alias*)
Disable the remote control of an instrument. The instrument will respond to query and read commands only.

**Parameters** **aux_alias** (str) – auxiliary's alias

**Return type** str

**Returns** the writing operation's status code

**set_remote_control_on**(*aux_alias*)
Enables the remote control of an instrument. The instrument will respond to all SCPI commands.

**Parameters** **aux_alias** (str) – auxiliary's alias

**Return type** str

**Returns** the writing operation's status code

**set_target_current**(*value*, *aux_alias*)
Set the desired output current (in A) of an instrument.

**Parameters**

- **value** (float) – value to be set on the instrument
- **aux_alias** (str) – auxiliary's alias

**Return type** str

**Returns** the writing operation's status code

**set_target_power**(*value*, *aux_alias*)
Set the desired output power (in W) of an instrument.

**Parameters**

- **value** (float) – value to be set on the instrument
- **aux_alias** (str) – auxiliary's alias

**Return type** str

**Returns** the writing operation's status code

**set_target_voltage**(*value*, *aux_alias*)
Set the desired output voltage (in V) of an instrument.

**Parameters**

- **value** (float) – value to be set on the instrument
- **aux_alias** (str) – auxiliary's alias

**Return type** str

**Returns** the writing operation's status code

**set_voltage_limit_high**(*limit_value*, *aux_alias*)
Set the voltage upper limit (in V) of an instrument.

**Parameters**

- **limit_value** (float) – limit value to be set on the instrument
- **aux_alias** (str) – auxiliary's alias

**Return type** str

**Returns** the writing operation's status code

**set_voltage_limit_low**(*limit_value*, *aux_alias*)
Set the voltage lower limit (in V) of an instrument.

**Parameters**

- **limit_value** (float) – limit value to be set on the instrument
- **aux_alias** (str) – auxiliary's alias

**Return type** str

**Returns** the writing operation's status code

**write**(*write_command*, *aux_alias*, *validation=None*)
Send a write request to the instrument and then returns if the value was successfully written. A query is sent immediately after the writing and the answer is compared to the expected one.

**Parameters**

- **write_command** (str) – write command to send
- **aux_alias** (str) – auxiliary's alias

- **validation** (Optional[tuple]) – tuple of the form (validation command (str), expected output (str))

**Return type** str

**Returns** status message depending on the command validation: SUCCESS, FAILURE or NO_VALIDATION

### 8.3.7 UDS Auxiliary plugin

**module** uds_auxiliary

**synopsis** implementation of existing UdsAuxiliary for Robot framework usage.

**class** pykiso.lib.robot_framework.uds_auxiliary.**UdsAuxiliary**
Robot framework plugin for UdsAuxiliary.

Initialize attributes.

**check_raw_response_negative**(*resp*, *aux_alias*)
Check if the response is negative, raise an error if not

**Parameters** **resp** (UdsResponse) – raw response of uds request

**Raises** **UnexpectedResponseError** – raised when the answer is not the expected one

**Return type** Optional[bool]

**Returns** True if response is negative

**check_raw_response_positive**(*resp*, *aux_alias*)
Check if the response is positive, raise an error if not

**Parameters** **resp** (UdsResponse) – raw response of uds request

**Raises** **UnexpectedResponseError** – raised when the answer is not the expected one

**Return type** Optional[bool]

**Returns** True if response is positive

**force_ecu_reset**(*aux_alias*)
Allow power reset of the component

**Parameters** **aux_alias** (str) – auxiliary's alias

**Return type** List[int]

**static get_service_id**(*service_name*)
Return the uds service id.

**Parameters** **service_name** (str) – service's name (EcuReset, ReadDataByIdentifier . . . )

**Return type** int

**Returns** corresponding service identification number

**hard_reset**(*aux_alias*)
Allow power reset of the component

**Parameters** **aux_alias** (str) – auxiliary's alias

**Return type** Union[dict, List[int]]

**read_data**(*parameter*, *aux_alias*)
UDS config command that allow data reading

**Parameters**

- **parameter** (str) – data to be read
- **aux_alias** (str) – auxiliary's alias

**Return type** Union[dict, bool]

**Returns** a dict with uds config response

**send_uds_config**(*msg_to_send*, *aux_alias*, *timeout_in_s=6*)
Send UDS config to the target ECU.

**Parameters**

- **msg_to_send** (dict) – uds config to be sent
- **aux_alias** (str) – auxiliary's alias
- **timeout_in_s** (float) – maximum time used to wait for a response

**Return type** Union[dict, bool]

**Returns** a dict containing the uds response, or True if a response is not expected and the command is properly sent otherwise False

**send_uds_raw**(*msg_to_send*, *aux_alias*, *timeout_in_s=6*, *response_required=True*)
Send a UDS diagnostic request to the target ECU.

**Parameters**

- **msg_to_send** (bytes) – can uds raw bytes to be sent
- **aux_alias** (str) – auxiliary's alias
- **timeout_in_s** (float) – maximum time used to wait for a response.
- **response_required** (bool) – Wait for a response if True

**Return type** Union[list, bool]

**Returns** the raw uds response's, or True if a response is not expected and the command is properly sent otherwise False

**soft_reset**(*aux_alias*)
Perform soft reset of the component, equivalent to a restart of application

**Parameters** **aux_alias** (str) – auxiliary's alias

**Return type** Union[dict, List[int]]

**start_tester_present_sender**(*aux_alias*, *period=4*)
Start to continuously sends tester present messages via UDS

**Parameters**

- **period** (int) – period in seconds to use for the cyclic sending of tester present
- **aux_alias** – auxiliary's alias

**Return type** None

**stop_tester_present_sender**(*aux_alias*)
Stop to continuously sends tester present messages via UDS

**Return type** None

**write_data**(*parameter*, *value*, *aux_alias*)
UDS config command that allow data reading

**Parameters**

- **parameter** (str) – data to be read
- **value** (Union[List[bytes], bytes]) – new content of the data
- **aux_alias** (str) – auxiliary's alias

**Return type** Union[dict, bool]

**Returns** a dict with uds config response

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