PyTango Documentation

Release 8.1.6

PyTango team

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CHAPTER

ONE

GETTING STARTED

1.1 Installing

1.1.1 Linux

PyTango is available on linux as an official debian/ubuntu package:

```
$ sudo apt-get install python-pytango
```

RPM packages are also available for RHEL & CentOS:

- RHEL 5/CentOS 5 32bits
- RHEL 5/CentOS 5 64bits
- RHEL 6/CentOS 6 32bits
- RHEL 6/CentOS 6 64bits

1.1.2 PyPi

You can also install the latest version from PyPi.

First, make sure you have the following packages already installed (all of them are available from the major official distribution repositories):

- boost-python (including boost-python-dev)
- numpy
- IPython (optional, highly recommended)

Then install PyTango either from pip:

```
$ pip install PyTango
```

or easy_install:

```
$ easy_install -U PyTango
```

1.1.3 Windows

First, make sure Python and numpy are installed.

PyTango team provides a limited set of binary PyTango distributables for Windows XP/Vista/7/8. The complete list of binaries can be downloaded from PyPI.

Select the proper windows package, download it and finally execute the installion wizard.

1.2 Compiling

1.2.1 Linux

Since PyTango 7 the build system used to compile PyTango is the standard python distutils.

Besides the binaries for the three dependencies mentioned above, you also need the development files for the respective libraries.

You can get the latest `.tar.gz` from PyPI or directly the latest SVN checkout:

```
$ svn co http://svn.code.sf.net/p/tango-cs/code/bindings/PyTango/trunk PyTango
$ cd PyTango
$ python setup.py build
$ sudo python setup.py install
```

This will install PyTango in the system python installation directory and, since version 8.0.0, it will also install *ITango* as an IPython extension.

If whish to install in a different directory, replace the last line with:

```
$ # private installation to your user (usually ~/.local/lib/python<X>.<Y>/site-packages
$ python setup.py install --user

$ # or specific installation directory
$ python setup.py install --prefix=/home/homer/local
```

1.2.2 Windows

On windows, PyTango must be built using MS VC++. Since it is rarely needed and the instructions are so complicated, I have choosen to place the how-to in a separate text file. You can find it in the source package under `doc/windows_notes.txt`.

1.3 Testing

If you have IPython installed, the best way to test your PyTango installation is by starting the new PyTango CLI called *ITango* by typing on the command line:

```
$ itango
```

then, in ITango type:

```
ITango [1]: PyTango.Release.version
Result [1]: '8.0.2'
```

(if you are wondering, *ITango* automaticaly does `import PyTango` for you!)

If you don't have IPython installed, to test the installation start a python console and type:

```
>>> import PyTango
>>> PyTango.Release.version
'8.0.2'
```

Next steps: Check out the *Quick tour*.

CHAPTER

TWO

QUICK TOUR

This quick tour will guide you through the first steps on using PyTango.

2.1 Fundamental TANGO concepts

Before you begin there are some fundamental TANGO concepts you should be aware of.

Tango consists basically of a set of **devices** running somewhere on the network.

A device is identified by a unique case insensitive name in the format *<domain>/<family>/<member>*. Examples: *LAB-01/PowerSupply/01*, *ID21/OpticsHutch/energy*.

Each device has a series of *attributes*, *properties* and *commands*.

An attribute is identified by a name in a device. It has a value that can be read. Some attributes can also be changed (read-write attributes).

A property is identified by a name in a device. Usually, devices properties are used to provide a way to configure a device.

A command is also identified by a name. A command may or not receive a parameter and may or not return a value when it is executed.

Any device has **at least** a *State* and *Status* attributes and *State*, *Status* and *Init* commands. Reading the *State* or *Status* attributes has the same effect as executing the *State* or *Status* commands.

Each device as an associated *TANGO Class*. Most of the times the TANGO class has the same name as the object oriented programming class which implements it but that is not mandatory.

TANGO devices *live* inside a operating system process called *TANGO Device Server*. This server acts as a container of devices. A device server can host multiple devices of multiple TANGO classes. Devices are, therefore, only accessible when the corresponding TANGO Device Server is running.

A special TANGO device server called the *TANGO Database Server* will act as a naming service between TANGO servers and clients. This server has a known address where it can be reached. The machines that run TANGO Device Servers and/or TANGO clients, should export an environment variable called `TANGO_HOST` that points to the TANGO Database server address. Example: `TANGO_HOST=homer.lab.eu:10000`

2.2 Minimum setup

This chapter assumes you have already installed PyTango.

To explore PyTango you should have a running Tango system. If you are working in a facility/institute that uses Tango, this has probably already been prepared for you. You need to ask your facility/institute tango contact for the `TANGO_HOST` variable where Tango system is running.

If you are working in an isolate machine you first need to make sure the Tango system is installed and running (Tango howtos).

Most examples here connect to a device called *sys/tg_test/1* that runs in a TANGO server called *TangoTest* with the instance name *test*. This server comes with the TANGO installation. The TANGO installation also registers the *test* instance. All you have to do is start the TangoTest server on a console:

```
$ TangoTest test
Ready to accept request
```

Note: if you receive a message saying that the server is already running, it just means that somebody has already started the test server so you don't need to do anything.

2.3 Client

Finally you can get your hands dirty. The first thing to do is start a python console and import the `PyTango` module. The following example shows how to create a proxy to an existing TANGO device, how to read and write attributes and execute commands from a python console:

```
>>> import PyTango

>>> # create a device object
>>> test_device = PyTango.DeviceProxy("sys/tg_test/1")

>>> # every device has a state and status which can be checked with:
>>> print(test_device.state())
RUNNING

>>> print(test_device.status())
The device is in RUNNING state.

>>> # this device has an attribute called "long_scalar". Let's see which value it has...
>>> data = test_device.read_attribute("long_scalar")

>>> # ...PyTango provides a shortcut to do the same:
>>> data = test_device["long_scalar"]

>>> # the result of reading an attribute is a DeviceAttribute python object.
>>> # It has a member called "value" which contains the value of the attribute
>>> data.value
136

>>> # Check the complete DeviceAttribute members:
>>> print(data)
DeviceAttribute[
data_format = SCALAR
      dim_x = 1
      dim_y = 0
 has_failed = False
   is_empty = False
       name = 'long_scalar'
    nb_read = 1
 nb_written = 1
    quality = ATTR_VALID
r_dimension = AttributeDimension(dim_x = 1, dim_y = 0)
       time = TimeVal(tv_nsec = 0, tv_sec = 1399450183, tv_usec = 323990)
       type = DevLong
      value = 136
    w_dim_x = 1
    w_dim_y = 0
w_dimension = AttributeDimension(dim_x = 1, dim_y = 0)
```

```
    w_value = 0]

>>> # PyTango provides a handy pythonic shortcut to read the attribute value:
>>> test_device.long_scalar
136

>>> # Setting an attribute value is equally easy:
>>> test_device.write_attribute("long_scalar", 8776)

>>> # ... and a handy shortcut to do the same exists as well:
>>> test_device.long_scalar = 8776

>>> # TangoTest has a command called "DevDouble" which receives a number
>>> # as parameter and returns the same number as a result. Let's
>>> # execute this command:
>>> test_device.command_inout("DevDouble", 45.67)
45.67

>>> # PyTango provides a handy shortcut: it exports commands as device methods:
>>> test_device.DevDouble(45.67)
45.67

>>> # Introspection: check the list of attributes:
>>> test_device.get_attribute_list()
['ampli', 'boolean_scalar', 'double_scalar', '...', 'State', 'Status']

>>>
```

This is just the tip of the iceberg. Check the `DeviceProxy` for the complete API.

PyTango comes with an integrated IPython based console called *ITango*. It provides helpers to simplify console usage. You can use this console instead of the traditional python console. Be aware, though, that many of the *tricks* you can do in an *ITango* console cannot be done in a python program.

2.4 Server

Since PyTango 8.1 it has become much easier to program a Tango device server. PyTango provides some helpers that allow developers to simplify the programming of a Tango device server.

Before creating a server you need to decide:

1. The name of the device server (example: *PowerSupplyDS*). This will be the mandatory name of your python file.
2. The Tango Class name of your device (example: *PowerSupply*). In our example we will use the same name as the python class name.
3. the list of attributes of the device, their data type, access (read-only vs read-write), data_format (scalar, 1D, 2D)
4. the list of commands, their parameters and their result

In our example we will write a fake power supply device server. The server will be called *PowerSupplyDS*. There will be a class called *PowerSupply* which will have attributes:

- *voltage* (scalar, read-only, numeric)
- *current* (scalar, read_write, numeric, expert mode)
- *noise* (2D, read-only, numeric)

commands:

- *TurnOn* (argument: None, result: None)

- *TurnOff* (argument: None, result: None)
- *Ramp* (param: scalar, numeric; result: bool)

properties:

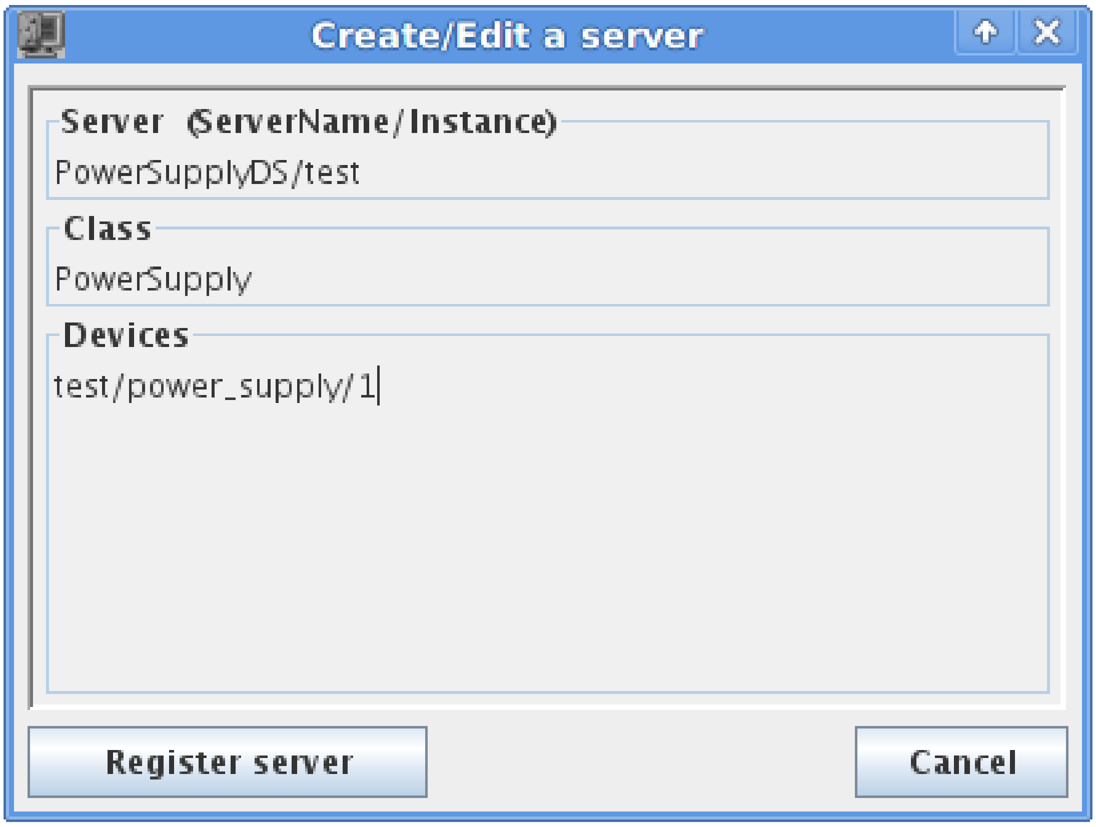
- *host* (string representing the host name of the actual power supply)
- *port* (port number in the host with default value = 9788)

Here is the code for the `PowerSupplyDS.py`

```python
#!/usr/bin/env python
# -*- coding: utf-8 -*-

"""Demo power supply tango device server"""

import time
import numpy

from PyTango import AttrQuality, AttrWriteType, DispLevel, DevState, DebugIt
from PyTango.server import Device, DeviceMeta, attribute, command, run
from PyTango.server import device_property


class PowerSupply(Device):
    __metaclass__ = DeviceMeta

    voltage = attribute(label="Voltage", dtype=float,
                        display_level=DispLevel.OPERATOR,
                        access=AttrWriteType.READ,
                        unit="V",format="8.4f",
                        doc="the power supply voltage")

    current = attribute(label="Current", dtype=float,
                        display_level=DispLevel.EXPERT,
                        access=AttrWriteType.READ_WRITE,
                        unit="A",format="8.4f",
                        min_value=0.0, max_value=8.5,
                        min_alarm=0.1, max_alarm=8.4,
                        min_warning=0.5, max_warning=8.0,
                        fget="get_current",
                        fset="set_current",
                        doc="the power supply current")

    noise = attribute(label="Noise",
                      dtype=((int,),),
                      max_dim_x=1024, max_dim_y=1024)

    host = device_property(dtype=str)
    port = device_property(dtype=int, default_value=9788)

    def init_device(self):
        Device.init_device(self)
        self.__current = 0.0
        self.set_state(DevState.STANDBY)

    def read_voltage(self):
        self.info_stream("read_voltage(%s, %d)", self.host, self.port)
        return 9.99, time.time(), AttrQuality.ATTR_WARNING

    def get_current(self):
        return self.__current

    def set_current(self, current):
            # should set the power supply current
            self.__current = current

    @DebugIt()
    def read_noise(self):
        return numpy.random.random_integers(1000, size=(100, 100))

    @command
    def TurnOn(self):
        # turn on the actual power supply here
        self.set_state(DevState.ON)

    @command
    def TurnOff(self):
        # turn off the actual power supply here
        self.set_state(DevState.OFF)

    @command(dtype_in=float, doc_in="Ramp target current",
             dtype_out=bool, doc_out="True if ramping went well, False otherwise")
    def Ramp(self, target_current):
        # should do the ramping
        return True


if __name__ == "__main__":
    run([PowerSupply])
```

Check the *high level server API* for the complete reference API. The *write a server how to* can help as well.

Before running this brand new server we need to register it in the Tango system. You can do it with Jive (*Jive->Edit->Create server*):


Create/Edit a server

Server (ServerName/Instance)
PowerSupplyDS/test

Class
PowerSupply

Devices
test/power_supply/1

... or in a python script:

```
>>> import PyTango

>>> dev_info = PyTango.DbDevInfo()
>>> dev_info.server = "PowerSupplyDS/test"
>>> dev_info._class = "PowerSupply"
>>> dev_info.name = "test/power_supply/1"

>>> db = PyTango.Database()
>>> db.add_device(dev_info)
```

After, you can run the server on a console with:

```
$ python PowerSupplyDS.py test
Ready to accept request
```

Now you can access it from a python console:

```
>>> import PyTango

>>> power_supply = PyTango.DeviceProxy("test/power/supply/1")
>>> power_supply.state()
STANDBY

>>> power_supply.current = 2.3

>>> power_supply.current
2.3

>>> power_supply.PowerOn()
>>> power_supply.Ramp(2.1)
True

>>> power_supply.state()
ON
```

Next steps: Check out the *PyTango API*.

CHAPTER

THREE

ITANGO

ITango is a PyTango CLI based on IPython. It is designed to be used as an IPython profile.

ITango is available since PyTango 7.1.2

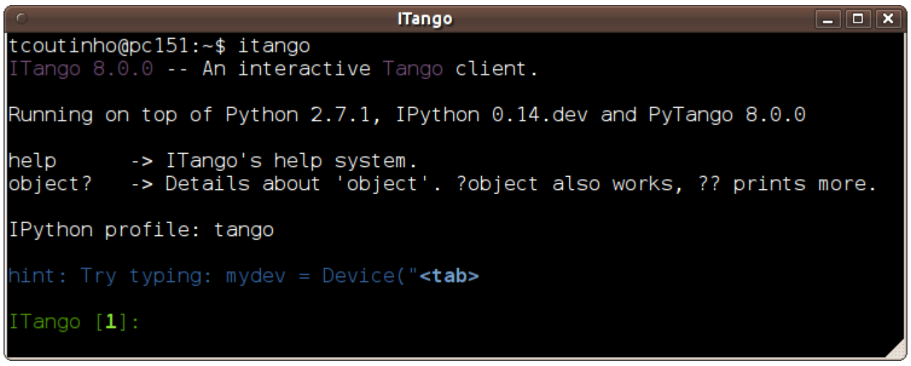
You can start ITango by typing on the command line:

```
$ itango
```

or the equivalent:

```
$ ipython --profile=tango
```

and you should get something like this:



```
tcoutinho@pc151:~$ itango
ITango 8.0.0 -- An interactive Tango client.

Running on top of Python 2.7.1, IPython 0.14.dev and PyTango 8.0.0

help      -> ITango's help system.
object?   -> Details about 'object'. ?object also works, ?? prints more.

IPython profile: tango

hint: Try typing: mydev = Device("<tab>

ITango [1]:
```

3.1 Features

ITango works like a normal python console, but it gives you in addition a nice set of features from IPython like:

- proper (bash-like) command completion
- automatic expansion of python variables, functions, types
- command history (with up/down arrow keys, %hist command)
- help system (object? syntax, help(object))
- persistently store your favorite variables
- color modes

(for a complete list checkout the IPython web page)

Plus an additional set o Tango specific features:

- automatic import of Tango objects to the console namespace (`PyTango` module, `DeviceProxy` (=Device), `Database`, `Group` and `AttributeProxy` (=Attribute))

- device name completion
- attribute name completion
- automatic tango object member completion
- list tango devices, classes, servers
- customized tango error message
- tango error introspection
- switch database
- refresh database
- list tango devices, classes
- store favorite tango objects
- store favorite tango devices
- tango color modes

Check the *Highlights* to see how to put these feature to good use :-)

3.2 Highlights

3.2.1 Tab completion

ITango exports many tango specific objects to the console namespace. These include:

- the PyTango module itself

```
ITango [1]: PyTango
Result [1]: <module 'PyTango' from ...>
```

- The `DeviceProxy` (=Device), `AttributeProxy` (=Attribute), `Database` and `Group` classes

```
ITango [1]: De<tab>
DeprecationWarning            Device       DeviceProxy

ITango [2]: Device
Result [2]: <class 'PyTango._PyTango.DeviceProxy'>

ITango [3]: Device("sys/tg_test/1")
Result [3]: DeviceProxy(sys/tg_test/1)

ITango [4]: Datab<tab>

ITango [4]: Database

ITango [4]: Att<tab>
Attribute       AttributeError  AttributeProxy
```

- The Tango `Database` object to which the itango session is currently connected

```
ITango [1]: db
Result [1]: Database(homer, 10000)
```

3.2.2 Device name completion

ITango knows the complete list of device names (including alias) for the current tango database. This means that when you try to create a new Device, by pressing <tab> you can see a context sensitive list of devices.

```
ITango [1]: test = Device("<tab>
Display all 3654 possibilities? (y or n) n

ITango [1]: test = Device("sys<tab>
sys/access_control/1  sys/database/2        sys/tautest/1         sys/tg_test/1

ITango [2]: test = Device("sys/tg_test/1")
```

3.2.3 Attribute name completion

ITango can inspect the list of attributes in case the device server for the device where the attribute resides is running.

```
ITango [1]: short_scalar = Attribute("sys<tab>
sys/access_control/1/  sys/database/2/        sys/tautest/1/         sys/tg_test/1/

ITango [1]: short_scalar = Attribute("sys/tg_test/1/<tab>
sys/tg_test/1/State                  sys/tg_test/1/no_value
sys/tg_test/1/Status                 sys/tg_test/1/short_image
sys/tg_test/1/ampli                  sys/tg_test/1/short_image_ro
sys/tg_test/1/boolean_image          sys/tg_test/1/short_scalar
sys/tg_test/1/boolean_image_ro       sys/tg_test/1/short_scalar_ro
sys/tg_test/1/boolean_scalar         sys/tg_test/1/short_scalar_rww
sys/tg_test/1/boolean_spectrum       sys/tg_test/1/short_scalar_w
sys/tg_test/1/boolean_spectrum_ro    sys/tg_test/1/short_spectrum
sys/tg_test/1/double_image           sys/tg_test/1/short_spectrum_ro
sys/tg_test/1/double_image_ro        sys/tg_test/1/string_image
sys/tg_test/1/double_scalar          sys/tg_test/1/string_image_ro
...

ITango [1]: short_scalar = Attribute("sys/tg_test/1/short_scalar")

ITango [29]: print test.read()
DeviceAttribute[
data_format = PyTango._PyTango.AttrDataFormat.SCALAR
  dim_x = 1
  dim_y = 0
has_failed = False
is_empty = False
   name = 'short_scalar'
nb_read = 1
nb_written = 1
quality = PyTango._PyTango.AttrQuality.ATTR_VALID
r_dimension = AttributeDimension(dim_x = 1, dim_y = 0)
   time = TimeVal(tv_nsec = 0, tv_sec = 1279723723, tv_usec = 905598)
   type = PyTango._PyTango.CmdArgType.DevShort
  value = 47
w_dim_x = 1
w_dim_y = 0
w_dimension = AttributeDimension(dim_x = 1, dim_y = 0)
w_value = 0]
```

3.2.4 Automatic tango object member completion

When you create a new tango object, (ex.: a device), itango is able to find out dynamically which are the members of this device (including tango commands and attributes if the device is currently running)

```
ITango [1]: test = Device("sys/tg_test/1")

ITango [2]: test.<tab>
Display all 240 possibilities? (y or n)
...
test.DevVoid                            test.get_access_control
test.Init                               test.get_asynch_replies
test.State                              test.get_attribute_config
test.Status                             test.get_attribute_config_ex
test.SwitchStates                       test.get_attribute_list
...

ITango [2]: test.short_<tab>
test.short_image        test.short_scalar       test.short_scalar_rww   test.short_spectrum
test.short_image_ro     test.short_scalar_ro    test.short_scalar_w     test.short_spectrum_ro

ITango [2]: test.short_scalar        # old style: test.read_attribute("short_scalar").value
Result [2]: 252

ITango [3]: test.Dev<tab>
test.DevBoolean              test.DevUShort                 test.DevVarShortArray
test.DevDouble               test.DevVarCharArray           test.DevVarStringArray
test.DevFloat                test.DevVarDoubleArray         test.DevVarULongArray
test.DevLong                 test.DevVarDoubleStringArray   test.DevVarUShortArray
test.DevShort                test.DevVarFloatArray          test.DevVoid
test.DevString               test.DevVarLongArray
test.DevULong                test.DevVarLongStringArray

ITango [3]: test.DevDouble(56.433)  # old style: test.command_inout("DevDouble").
Result [3]: 56.433
```

3.2.5 Tango classes as `DeviceProxy`

ITango exports all known tango classes as python alias to `DeviceProxy`. This way, if you want to create a device of class which you already know (say, Libera, for example) you can do:

```
ITango [1]: lib01 = Libera("BO01/DI/BPM-01")
```

One great advantage is that the tango device name completion is sensitive to the type of device you want to create. This means that if you are in the middle of writting a device name and you press the <tab> key, only devices of the tango class 'Libera' will show up as possible completions.

```
ITango [1]: bpm1 = Libera("<tab>
BO01/DI/BPM-01  BO01/DI/BPM-09  BO02/DI/BPM-06  BO03/DI/BPM-03  BO03/DI/BPM-11  BO04/DI/BPM-08
BO01/DI/BPM-02  BO01/DI/BPM-10  BO02/DI/BPM-07  BO03/DI/BPM-04  BO04/DI/BPM-01  BO04/DI/BPM-09
BO01/DI/BPM-03  BO01/DI/BPM-11  BO02/DI/BPM-08  BO03/DI/BPM-05  BO04/DI/BPM-02  BO04/DI/BPM-10
BO01/DI/BPM-04  BO02/DI/BPM-01  BO02/DI/BPM-09  BO03/DI/BPM-06  BO04/DI/BPM-03  BO04/DI/BPM-11
BO01/DI/BPM-05  BO02/DI/BPM-02  BO02/DI/BPM-10  BO03/DI/BPM-07  BO04/DI/BPM-04
BO01/DI/BPM-06  BO02/DI/BPM-03  BO02/DI/BPM-11  BO03/DI/BPM-08  BO04/DI/BPM-05
BO01/DI/BPM-07  BO02/DI/BPM-04  BO03/DI/BPM-01  BO03/DI/BPM-09  BO04/DI/BPM-06
BO01/DI/BPM-08  BO02/DI/BPM-05  BO03/DI/BPM-02  BO03/DI/BPM-10  BO04/DI/BPM-07

ITango [1]: bpm1 = Libera("BO01<tab>
BO01/DI/BPM-01  BO01/DI/BPM-03  BO01/DI/BPM-05  BO01/DI/BPM-07  BO01/DI/BPM-09  BO01/DI/BPM-11
```

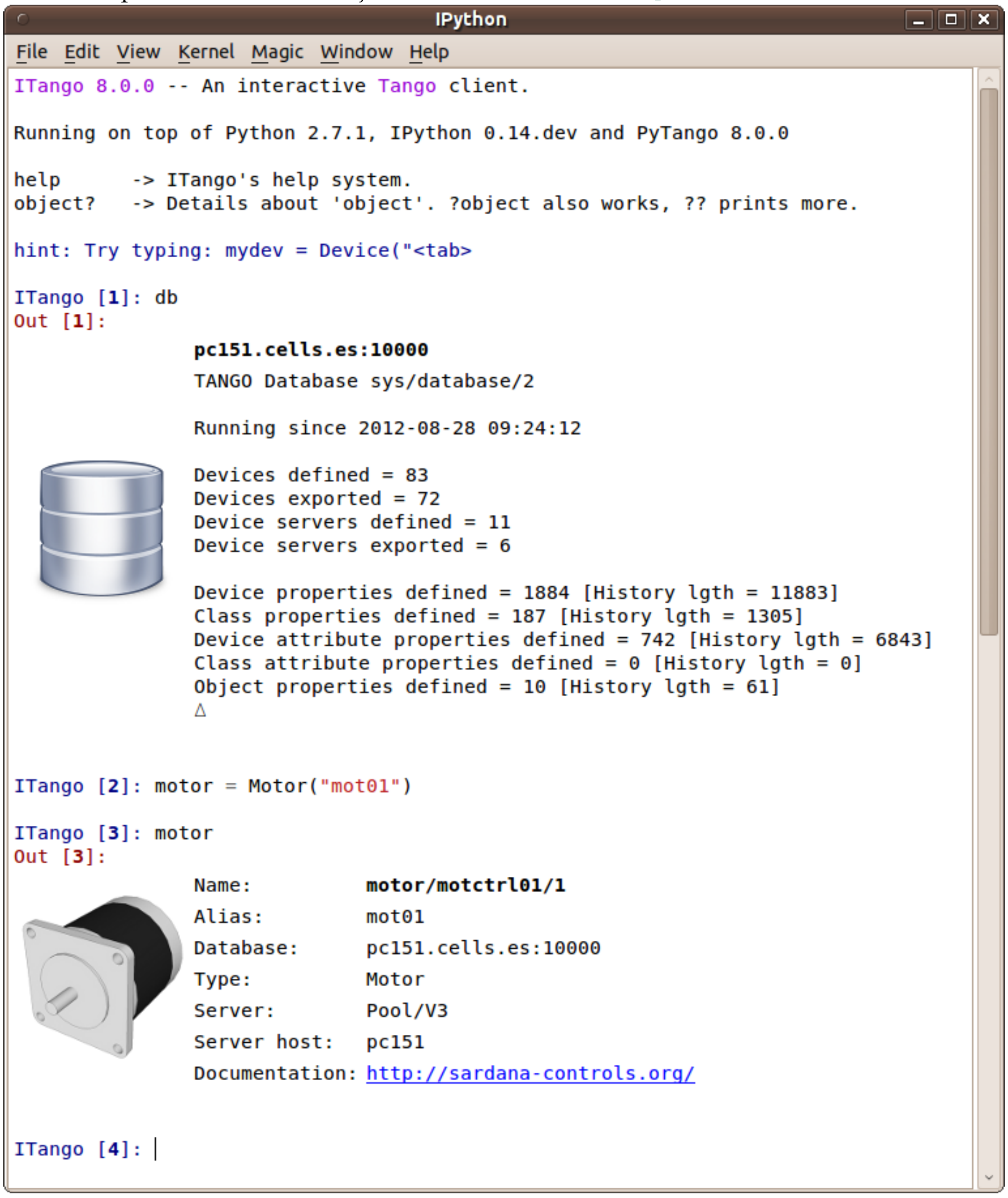
```
BO01/DI/BPM-02  BO01/DI/BPM-04  BO01/DI/BPM-06  BO01/DI/BPM-08  BO01/DI/BPM-10

ITango [1]: bpm1 = Libera("BO01/DI/BPM-01")
```

3.2.6 Customized device representation

When you use ipython >= 0.11 with a Qt console frontend:

```
$ itango qtconsole
```

typing a variable containing a tango device object followend by `Enter` will present you with a customized representation of the object instead of the usual `repr()` :



```
ITango 8.0.0 -- An interactive Tango client.

Running on top of Python 2.7.1, IPython 0.14.dev and PyTango 8.0.0

help      -> ITango's help system.
object?   -> Details about 'object'. ?object also works, ?? prints more.

hint: Try typing: mydev = Device("<tab>

ITango [1]: db
Out [1]:
                pc151.cells.es:10000
                TANGO Database sys/database/2

                Running since 2012-08-28 09:24:12

                Devices defined = 83
                Devices exported = 72
                Device servers defined = 11
                Device servers exported = 6

                Device properties defined = 1884 [History lgth = 11883]
                Class properties defined = 187 [History lgth = 1305]
                Device attribute properties defined = 742 [History lgth = 6843]
                Class attribute properties defined = 0 [History lgth = 0]
                Object properties defined = 10 [History lgth = 61]
                Δ

ITango [2]: motor = Motor("mot01")

ITango [3]: motor
Out [3]:
                Name:          motor/motctrl01/1
                Alias:         mot01
                Database:      pc151.cells.es:10000
                Type:          Motor
                Server:        Pool/V3
                Server host:   pc151
                Documentation: http://sardana-controls.org/

ITango [4]: |
```

You can customize the icon that itango displays for a specific device. The first thing to do is to copy the image file into `PyTango.ipython.resource` installation directory (if you don't have permissions to do so, copy the image into a directory of your choosing and make sure it is accessible from itango).

If you want to use the image for all devices of a certain tango class, just add a new tango class property called *__icon*. You can do it with jive or, of course, with itango itself:

```
db.put_class_property("Libera", dict(__icon="libera.png"))

# if you placed your image in a directory different than PyTango.ipython.resource
# then, instead you have to specify the absolute directory

db.put_class_property("Libera", dict(__icon="/home/homer/.config/itango/libera.png"))
```

If you need different images for different devices of the same class, you can specify an *__icon* property at the device level (which takes precedence over the class property value, if defined):

```
db.put_device_property("BO01/DI/BPM-01", dict(__icon="libera2.png"))
```

3.2.7 List tango devices, classes, servers

ITango provides a set of magic functions (ipython lingo) that allow you to check for the list tango devices, classes and servers which are registered in the current database.

```
ITango [1]: lsdev
                                  Device                     Alias                    Server
---------------------------------------- ------------------------- ------------------------- ----
              expchan/BL99_Dummy0DCtrl/1                  BL99_0D1                 Pool/BL99
                  simulator/bl98/motor08                                      Simulator/BL98
              expchan/BL99_Dummy0DCtrl/3                  BL99_0D3                 Pool/BL99
              expchan/BL99_Dummy0DCtrl/2                  BL99_0D2                 Pool/BL99
              expchan/BL99_Dummy0DCtrl/5                  BL99_0D5                 Pool/BL99
              expchan/BL99_Dummy0DCtrl/4                  BL99_0D4                 Pool/BL99
              expchan/BL99_Dummy0DCtrl/7                  BL99_0D7                 Pool/BL99
              expchan/BL99_Dummy0DCtrl/6                  BL99_0D6                 Pool/BL99
                  simulator/bl98/motor01                                      Simulator/BL98
                  simulator/bl98/motor02                                      Simulator/BL98
                  simulator/bl98/motor03                                      Simulator/BL98
   mg/BL99/_mg_macserv_26065_-1320158352                                           Pool/BL99
                  simulator/bl98/motor05                                      Simulator/BL98
                  simulator/bl98/motor06                                      Simulator/BL98
                  simulator/bl98/motor07                                      Simulator/BL98
                simulator/BL98/motctrl01                                      Simulator/BL98
              expchan/BL99_Simu0DCtrl1/1                  BL99_0D8                 Pool/BL99
             expchan/BL99_UxTimerCtrl1/1                BL99_Timer                 Pool/BL99
...

ITango [1]: lsdevclass
SimuCoTiCtrl                   TangoAccessControl             ZeroDExpChannel
Door                           Motor                          DataBase
MotorGroup                     IORegister                     SimuMotorCtrl
TangoTest                      MacroServer                    TauTest
SimuMotor                      SimuCounterEx                  MeasurementGroup
Pool                           CTExpChannel

ITango [1]: lsserv
MacroServer/BL99               MacroServer/BL98               Pool/V2
Pool/BL99                      Pool/BL98                      TangoTest/test
Pool/tcoutinho                 Simulator/BL98
TangoAccessControl/1           TauTest/tautest                DataBaseds/2
MacroServer/tcoutinho          Simulator/BL99
```

3.2.8 Customized tango error message and introspection

ITango intercepts tango exceptions that occur when you do tango operations (ex.: write an attribute with a value outside the allowed limits) and tries to display it in a summarized, user friendly way. If you need more detailed information about the last tango error, you can use the magic command 'tango_error'.

```
ITango [1]: test = Device("sys/tg_test/1")

ITango [2]: test.no_value
API_AttrValueNotSet : Read value for attribute no_value has not been updated
For more detailed information type: tango_error

ITango [3]: tango_error
Last tango error:
DevFailed[
DevError[
    desc = 'Read value for attribute no_value has not been updated'
  origin = 'Device_3Impl::read_attributes_no_except'
  reason = 'API_AttrValueNotSet'
severity = PyTango._PyTango.ErrSeverity.ERR]
DevError[
    desc = 'Failed to read_attribute on device sys/tg_test/1, attribute no_value'
  origin = 'DeviceProxy::read_attribute()'
  reason = 'API_AttributeFailed'
severity = PyTango._PyTango.ErrSeverity.ERR]]
```

3.2.9 Switching database

You can switch database simply by executing the 'switchdb <host> [<port>]' magic command.

```
ITango [1]: switchdb

Must give new database name in format <host>[:<port>].
<port> is optional. If not given it defaults to 10000.

Examples:
switchdb homer:10005
switchdb homer 10005
switchdb homer

ITango [2]: db
Database(homer, 10000)

ITango [3]: switchdb bart       # by default port is 10000

ITango [4]: db
Database(bart, 10000)

ITango [5]: switchdb lisa 10005  # you can use spaces between host and port

ITango [6]: db
Database(lisa, 10005)

ITango [7]: switchdb marge:10005   # or the traditional ':'

ITango [8]: db
Database(marge, 10005)
```

3.2.10 Refreshing the database

When itango starts up or when the database is switched, a query is made to the tango Database device server which provides all necessary data. This data is stored locally in a itango cache which is used to provide all the nice features. If the Database server is changed in some way (ex: a new device server is registered), the local database cache is not consistent anymore with the tango database. Therefore, itango provides a magic command 'refreshdb' that allows you to reread all tango information from the database.

```
ITango [1]: refreshdb
```

3.2.11 Storing your favorite tango objects for later usage

Note: This feature is not available if you have installed IPython 0.11!

Since version 7.1.2, `DeviceProxy`, `AttributeProxy` and `Database` became pickable. This means that they can be used by the IPython 'store' magic command (type 'store?' on the itango console to get information on how to use this command). You can, for example, assign your favorite devices in local python variables and then store these for the next time you startup IPython with itango profile.

```
ITango [1]: theta = Motor("BL99_M1")  # notice how we used tango alias

ITango [2]: store theta
Stored 'theta' (DeviceProxy)

ITango [3]: Ctrl+D

(IPython session is closed and started again...)

ITango [1]: store -r # in some versions of IPython you may need to do this ...

ITango [1]: print theta
DeviceProxy(motor/bl99/1)
```

3.2.12 Adding itango to your own ipython profile

Adding itango to the ipython default profile

Let's assume that you find itango so useful that each time you start ipython, you want itango features to be loaded by default. The way to do this is by editing your default ipython configuration file:

1. On IPython <= 0.10

   $HOME/.ipython/ipy_user_conf.py and add the lines 1 and 7.

   Note: The code shown below is a small part of your $HOME/.ipython/ipy_user_conf.py. It is shown here only the relevant part for this example.

   ```
   import PyTango.ipython

   def main():

       # uncomment if you want to get ipython -p sh behaviour
       # without having to use command line switches
   ```

```
    # import ipy_profile_sh
    PyTango.ipython.init_ipython(ip, console=False)
```

2. On IPython > 0.10

   First you have to check which is the configuration directory being used by IPython. For this, in an IPython console type:

   ```
   ITango [1]: import IPython.utils.path

   ITango [2]: IPython.utils.path.get_ipython_dir()
   <IPYTHON_DIR>
   ```

   now edit <IPYTHON_DIR>/profile_default/ipython_config.py and add the following line at the end to add itango configuration:

   ```
   load_subconfig('ipython_config.py', profile='tango')
   ```

   Alternatively, you could also load itango as an IPython extension:

   ```
   config = get_config()
   i_shell_app = config.InteractiveShellApp
   extensions = getattr(i_shell_app, 'extensions', [])
   extensions.append('PyTango.ipython')
   i_shell_app.extensions = extensions
   ```

   for more information on how to configure IPython >= 0.11 please check the IPython configuration

And now, every time you start ipython:

```
ipython
```

itango features will also be loaded.

```
In [1]: db
Out[1]: Database(homer, 10000)
```

Adding itango to an existing customized profile

Note: This chapter has a pending update. The contents only apply to IPython <= 0.10.

If you have been working with IPython before and have already defined a customized personal profile, you can extend your profile with itango features without breaking your existing options. The trick is to initialize itango extension with a parameter that tells itango to maintain the existing options (like colors, command line and initial banner).

So, for example, let's say you have created a profile called nuclear, and therefore you have a file called $HOME/.ipython/ipy_profile_nuclear.py with the following contents:

```
import os
import IPython.ipapi

def main():
    ip = IPython.ipapi.get()

    o = ip.options
```

```
    o.banner = "Springfield nuclear powerplant CLI\n\nWelcome Homer Simpson"
    o.colors = "Linux"
    o.prompt_in1 = "Mr. Burns owns you [\\#]: "

main()
```

In order to have itango features available to this profile you simply need to add two lines of code (lines 3 and 7):

```
import os
import IPython.ipapi
import PyTango.ipython

def main():
    ip = IPython.ipapi.get()
    PyTango.ipython.init_ipython(ip, console=False)

    o = ip.options
    o.banner = "Springfield nuclear powerplant CLI\n\nMr. Burns owns you!"
    o.colors = "Linux"
    o.prompt_in1 = "The Simpsons [\\#]: "

main()
```

This will load the itango features into your profile while preserving your profile's console options (like colors, command line and initial banner).

Creating a profile that extends itango profile

Note: This chapter has a pending update. The contents only apply to IPython <= 0.10.

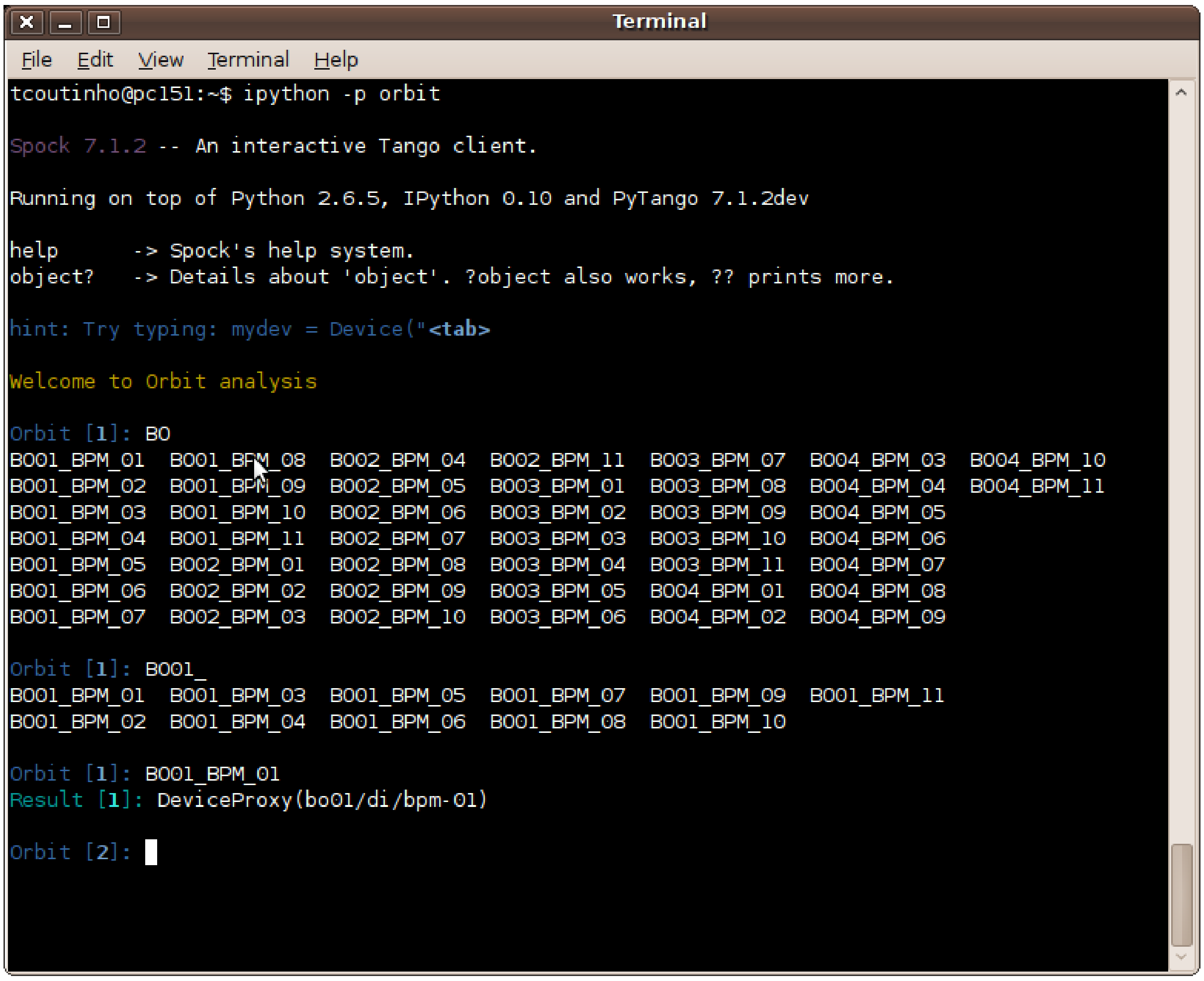
It is also possible to create a profile that includes all itango features and at the same time adds new ones. Let's suppose that you want to create a customized profile called 'orbit' that automaticaly exports devices of class 'Libera' for the booster accelerator (assuming you are working on a synchrotron like institute ;-). Here is the code for the $HOME/.ipython/ipy_profile_orbit.py:

```
import os
import IPython.ipapi
import IPython.genutils
import IPython.ColorANSI
import PyTango.ipython
import StringIO

def magic_liberas(ip, p=''):
    """Lists all known Libera devices."""
    data = PyTango.ipython.get_device_map()
    s = StringIO.StringIO()
    cols = 30, 15, 20
    l = "%{0}s %{1}s %{2}s".format(*cols)
    print >>s, l % ("Device", "Alias", "Server")
    print >>s, l % (cols[0]*"-", cols[1]*"-", cols[2]*"-")
    for d, v in data.items():
        if v[2] != 'Libera': continue
        print >>s, l % (d, v[0], v[1])
    s.seek(0)
    IPython.genutils.page(s.read())

def main():
    ip = IPython.ipapi.get()
    PyTango.ipython.init_ipython(ip)

    o = ip.options

    Colors = IPython.ColorANSI.TermColors
    c = dict(Colors.__dict__)

    o.banner += "\n{Brown}Welcome to Orbit analysis{Normal}\n".format(**c)

    o.prompt_in1 = "Orbit [\\#]: "
    o.colors = "BlueTango"

    ip.expose_magic("liberas", magic_liberas)

    db = ip.user_ns.get('db')
    dev_class_dict = PyTango.ipython.get_class_map()

    if not dev_class_dict.has_key("Libera"):
        return

    for libera in dev_class_dict['Libera']:
        domain, family, member = libera.split("/")
        var_name = domain + "_" + member
        var_name = var_name.replace("-","_")
        ip.to_user_ns( { var_name : PyTango.DeviceProxy(libera) } )

main()
```

Then start your CLI with:

```
$ ipython --profile=orbit
```

and you will have something like this



```
tcoutinho@pc151:~$ ipython -p orbit

Spock 7.1.2 -- An interactive Tango client.

Running on top of Python 2.6.5, IPython 0.10 and PyTango 7.1.2dev

help      -> Spock's help system.
object?   -> Details about 'object'. ?object also works, ?? prints more.

hint: Try typing: mydev = Device("<tab>

Welcome to Orbit analysis

Orbit [1]: BO
BO01_BPM_01  BO01_BPM_08  BO02_BPM_04  BO02_BPM_11  BO03_BPM_07  BO04_BPM_03  BO04_BPM_10
BO01_BPM_02  BO01_BPM_09  BO02_BPM_05  BO03_BPM_01  BO03_BPM_08  BO04_BPM_04  BO04_BPM_11
BO01_BPM_03  BO01_BPM_10  BO02_BPM_06  BO03_BPM_02  BO03_BPM_09  BO04_BPM_05
BO01_BPM_04  BO01_BPM_11  BO02_BPM_07  BO03_BPM_03  BO03_BPM_10  BO04_BPM_06
BO01_BPM_05  BO02_BPM_01  BO02_BPM_08  BO03_BPM_04  BO03_BPM_11  BO04_BPM_07
BO01_BPM_06  BO02_BPM_02  BO02_BPM_09  BO03_BPM_05  BO04_BPM_01  BO04_BPM_08
BO01_BPM_07  BO02_BPM_03  BO02_BPM_10  BO03_BPM_06  BO04_BPM_02  BO04_BPM_09

Orbit [1]: BO01_
BO01_BPM_01  BO01_BPM_03  BO01_BPM_05  BO01_BPM_07  BO01_BPM_09  BO01_BPM_11
BO01_BPM_02  BO01_BPM_04  BO01_BPM_06  BO01_BPM_08  BO01_BPM_10

Orbit [1]: BO01_BPM_01
Result [1]: DeviceProxy(bo01/di/bpm-01)

Orbit [2]:
```

3.2.13 Advanced event monitoring

Note: This chapter has a pending update. The contents only apply to IPython <= 0.10.

With itango it is possible to monitor change events triggered by any tango attribute which has events enabled.

To start monitoring the change events of an attribute:

```
ITango [1]: mon -a BL99_M1/Position
'BL99_M1/Position' is now being monitored. Type 'mon' to see all events
```

To list all events that have been intercepted:

```
ITango [2]: mon
  ID           Device    Attribute            Value       Quality             Time
---- ---------------- ------------ ---------------- ------------- ----------------
   0     motor/bl99/1        state               ON    ATTR_VALID  17:11:08.026472
   1     motor/bl99/1     position            190.0    ATTR_VALID  17:11:20.691112
   2     motor/bl99/1        state           MOVING    ATTR_VALID  17:12:11.858985
   3     motor/bl99/1     position    188.954072857 ATTR_CHANGING  17:12:11.987817
   4     motor/bl99/1     position    186.045533882 ATTR_CHANGING  17:12:12.124448
   5     motor/bl99/1     position    181.295838155 ATTR_CHANGING  17:12:12.260884
   6     motor/bl99/1     position     174.55354729 ATTR_CHANGING  17:12:12.400036
   7     motor/bl99/1     position     166.08870515 ATTR_CHANGING  17:12:12.536387
   8     motor/bl99/1     position     155.77528943 ATTR_CHANGING  17:12:12.672846
   9     motor/bl99/1     position    143.358230136 ATTR_CHANGING  17:12:12.811878
  10     motor/bl99/1     position    131.476140017 ATTR_CHANGING  17:12:12.950391
  11     motor/bl99/1     position    121.555421781 ATTR_CHANGING  17:12:13.087970
  12     motor/bl99/1     position    113.457930987 ATTR_CHANGING  17:12:13.226531
  13     motor/bl99/1     position    107.319423091 ATTR_CHANGING  17:12:13.363559
  14     motor/bl99/1     position    102.928229946 ATTR_CHANGING  17:12:13.505102
  15     motor/bl99/1     position    100.584726495 ATTR_CHANGING  17:12:13.640794
  16     motor/bl99/1     position            100.0    ATTR_ALARM  17:12:13.738136
  17     motor/bl99/1        state            ALARM    ATTR_VALID  17:12:13.743481

ITango [3]: mon -l mot.* state
  ID           Device    Attribute            Value       Quality             Time
---- ---------------- ------------ ---------------- ------------- ----------------
   0     motor/bl99/1        state               ON    ATTR_VALID  17:11:08.026472
   2     motor/bl99/1        state           MOVING    ATTR_VALID  17:12:11.858985
  17     motor/bl99/1        state            ALARM    ATTR_VALID  17:12:13.743481
```

To stop monitoring the attribute:

```
ITango [1]: mon -d BL99_M1/Position
Stopped monitoring 'BL99_M1/Position'
```

Note: Type 'mon?' to see detailed information about this magic command

CHAPTER

FOUR

GREEN MODE

PyTango supports cooperative green Tango objects. Since version 8.1 two *green* modes have been added: `Futures` and `Gevent`.

The `Futures` uses the standard python module `concurrent.futures`. The `Gevent` mode uses the well known gevent library.

Currently, in version 8.1, only `DeviceProxy` has been modified to work in a green cooperative way. If the work is found to be useful, the same can be implemented in the future for `AttributeProxy`, `Database`, `Group` or even in the server side.

You can set the PyTango green mode at a global level. Set the environment variable `PYTANGO_GREEN_MODE` to either *futures* or *gevent* (case incensitive). If this environment variable is not defined the PyTango global green mode defaults to *Synchronous*.

You can also change the active global green mode at any time in your program:

```
>>> from PyTango import DeviceProxy, GreenMode
>>> from PyTango import set_green_mode, get_green_mode

>>> get_green_mode()
PyTango.GreenMode.Synchronous

>>> dev = DeviceProxy("sys/tg_test/1")
>>> dev.get_green_mode()
PyTango.GreenMode.Synchronous

>>> set_green_mode(GreenMode.Futures)
>>> get_green_mode()
PyTango.GreenMode.Futures

>>> dev.get_green_mode()
PyTango.GreenMode.Futures
```

As you can see by the example, the global green mode will affect any previously created `DeviceProxy` using the default *DeviceProxy* constructor parameters.

You can specificy green mode on a `DeviceProxy` at creation time. You can also change the green mode at any time:

```
>>> from PyTango.futures import DeviceProxy

>>> dev = DeviceProxy("sys/tg_test/1")
>>> dev.get_green_mode()
PyTango.GreenMode.Futures

>>> dev.set_green_mode(GreenMode.Synchronous)
>>> dev.get_green_mode()
PyTango.GreenMode.Synchronous
```

4.1 futures mode

Using `concurrent.futures` cooperative mode in PyTango is relatively easy:

```
>>> from PyTango.futures import DeviceProxy

>>> dev = DeviceProxy("sys/tg_test/1")
>>> dev.get_green_mode()
PyTango.GreenMode.Futures

>>> print(dev.state())
RUNNING
```

The `PyTango.futures.DeviceProxy()` API is exactly the same as the standard `DeviceProxy`. The difference is in the semantics of the methods that involve synchronous network calls (constructor included) which may block the execution for a relatively big amount of time. The list of methods that have been modified to accept *futures* semantics are, on the `PyTango.futures.DeviceProxy()`:

- Constructor
- `state()`
- `status()`
- `read_attribute()`
- `write_attribute()`
- `write_read_attribute()`
- `read_attributes()`
- `write_attributes()`
- `ping()`

So how does this work in fact? I see no difference from using the *standard* `DeviceProxy`. Well, this is, in fact, one of the goals: be able to use a *futures* cooperation without changing the API. Behind the scenes the methods mentioned before have been modified to be able to work cooperatively.

All of the above methods have been boosted with two extra keyword arguments *wait* and *timeout* which allow to fine tune the behaviour. The *wait* parameter is by default set to *True* meaning wait for the request to finish (the default semantics when not using green mode). If *wait* is set to *True*, the timeout determines the maximum time to wait for the method to execute. The default is *None* which means wait forever. If *wait* is set to *False*, the *timeout* is ignored.

If *wait* is set to *True*, the result is the same as executing the *standard* method on a `DeviceProxy`. If, *wait* is set to *False*, the result will be a `concurrent.futures.Future`. In this case, to get the actual value you will need to do something like:

```
>>> from PyTango.futures import DeviceProxy

>>> dev = DeviceProxy("sys/tg_test/1")
>>> result = dev.state(wait=False)
>>> result
<Future at 0x16cb310 state=pending>

>>> # this will be the blocking code
>>> state = result.result()
>>> print(state)
RUNNING
```

Here is another example using `read_attribute()`:

```
>>> from PyTango.futures import DeviceProxy

>>> dev = DeviceProxy("sys/tg_test/1")
>>> result = dev.read_attribute('wave', wait=False)
>>> result
<Future at 0x16cbe50 state=pending>

>>> dev_attr = result.result()
>>> print(dev_attr)
DeviceAttribute[
data_format = PyTango.AttrDataFormat.SPECTRUM
      dim_x = 256
      dim_y = 0
 has_failed = False
   is_empty = False
       name = 'wave'
    nb_read = 256
 nb_written = 0
    quality = PyTango.AttrQuality.ATTR_VALID
r_dimension = AttributeDimension(dim_x = 256, dim_y = 0)
       time = TimeVal(tv_nsec = 0, tv_sec = 1383923329, tv_usec = 451821)
       type = PyTango.CmdArgType.DevDouble
      value = array([ -9.61260664e-01,  -9.65924853e-01,  -9.70294813e-01,
        -9.74369212e-01,  -9.78146810e-01,  -9.81626455e-01,
        -9.84807087e-01,  -9.87687739e-01,  -9.90267531e-01,
        ...
        5.15044507e-1])
    w_dim_x = 0
    w_dim_y = 0
w_dimension = AttributeDimension(dim_x = 0, dim_y = 0)
    w_value = None]
```

4.2 gevent mode

Warning: Before using gevent mode please note that at the time of writing this documentation, *PyTango.gevent* requires the latest version 1.0 of gevent (which has been released the day before :-P). Also take into account that gevent 1.0 is *not* available on python 3. Please consider using the *Futures* mode instead.

Using gevent cooperative mode in PyTango is relatively easy:

```
>>> from PyTango.gevent import DeviceProxy

>>> dev = DeviceProxy("sys/tg_test/1")
>>> dev.get_green_mode()
PyTango.GreenMode.Gevent

>>> print(dev.state())
RUNNING
```

The `PyTango.gevent.DeviceProxy()` API is exactly the same as the standard `DeviceProxy`. The difference is in the semantics of the methods that involve synchronous network calls (constructor included) which may block the execution for a relatively big amount of time. The list of methods that have been modified to accept *gevent* semantics are, on the `PyTango.gevent.DeviceProxy()`:

- Constructor
- `state()`

- `status()`
- `read_attribute()`
- `write_attribute()`
- `write_read_attribute()`
- `read_attributes()`
- `write_attributes()`
- `ping()`

So how does this work in fact? I see no difference from using the *standard* `DeviceProxy`. Well, this is, in fact, one of the goals: be able to use a gevent cooperation without changing the API. Behind the scenes the methods mentioned before have been modified to be able to work cooperatively with other greenlets.

All of the above methods have been boosted with two extra keyword arguments *wait* and *timeout* which allow to fine tune the behaviour. The *wait* parameter is by default set to *True* meaning wait for the request to finish (the default semantics when not using green mode). If *wait* is set to *True*, the timeout determines the maximum time to wait for the method to execute. The default timeout is *None* which means wait forever. If *wait* is set to *False*, the *timeout* is ignored.

If *wait* is set to *True*, the result is the same as executing the *standard* method on a `DeviceProxy`. If, *wait* is set to *False*, the result will be a `gevent.event.AsyncResult`. In this case, to get the actual value you will need to do something like:

```
>>> from PyTango.gevent import DeviceProxy

>>> dev = DeviceProxy("sys/tg_test/1")
>>> result = dev.state(wait=False)
>>> result
<gevent.event.AsyncResult at 0x1a74050>

>>> # this will be the blocking code
>>> state = result.get()
>>> print(state)
RUNNING
```

Here is another example using `read_attribute()`:

```
>>> from PyTango.gevent import DeviceProxy

>>> dev = DeviceProxy("sys/tg_test/1")
>>> result = dev.read_attribute('wave', wait=False)
>>> result
<gevent.event.AsyncResult at 0x1aff54e>

>>> dev_attr = result.get()
>>> print(dev_attr)
DeviceAttribute[
data_format = PyTango.AttrDataFormat.SPECTRUM
      dim_x = 256
      dim_y = 0
 has_failed = False
   is_empty = False
       name = 'wave'
    nb_read = 256
 nb_written = 0
    quality = PyTango.AttrQuality.ATTR_VALID
r_dimension = AttributeDimension(dim_x = 256, dim_y = 0)
       time = TimeVal(tv_nsec = 0, tv_sec = 1383923292, tv_usec = 886720)
       type = PyTango.CmdArgType.DevDouble
      value = array([ -9.61260664e-01,  -9.65924853e-01,  -9.70294813e-01,
        -9.74369212e-01,  -9.78146810e-01,  -9.81626455e-01,
        -9.84807087e-01,  -9.87687739e-01,  -9.90267531e-01,
        ...
        5.15044507e-1])
    w_dim_x = 0
    w_dim_y = 0
w_dimension = AttributeDimension(dim_x = 0, dim_y = 0)
    w_value = None]
```

Note: due to the internal workings of gevent, setting the *wait* flag to *True* (default) doesn't prevent other greenlets from running in *parallel*. This is, in fact, one of the major bonus of working with `gevent` when compared with `concurrent.futures`

CHAPTER

FIVE

PYTANGO API

This module implements the Python Tango Device API mapping.

5.1 Data types

This chapter describes the mapping of data types between Python and Tango.

Tango has more data types than Python which is more dynamic. The input and output values of the commands are translated according to the array below. Note that if PyTango is compiled with `numpy` support the numpy type will be the used for the input arguments. Also, it is recomended to use numpy arrays of the appropiate type for output arguments as well, as they tend to be much more efficient.

For scalar types (SCALAR)

Tango data type	Python 2.x type	Python 3.x type (*New in PyTango 8.0*)
DEV_VOID	No data	No data
DEV_BOOLEAN	`bool`	`bool`
DEV_SHORT	`int`	`int`
DEV_LONG	`int`	`int`
DEV_LONG64	• `long` (on a 32 bits computer) • `int` (on a 64 bits computer)	`int`
DEV_FLOAT	`float`	`float`
DEV_DOUBLE	`float`	`float`
DEV_USHORT	`int`	`int`
DEV_ULONG	`int`	`int`
DEV_ULONG64	• `long` (on a 32 bits computer) • `int` (on a 64 bits computer)	`int`
DEV_STRING	`str`	`str` (decoded with *latin-1*, aka *ISO-8859-1*)
DEV_ENCODED (*New in PyTango 8.0*)	sequence of two elements: 0. `str` 1. `bytes` (for any value of *extract_as*)	sequence of two elements: 0. `str` (decoded with *latin-1*, aka *ISO-8859-1*) 1. `bytes` (for any value of *extract_as*, except String. In this case it is `str` (decoded with default python encoding *utf-8*))

For array types (SPECTRUM/IMAGE)

Tango data type	ExtractAs	Data type (Python 2.x)	Data type (Python 3.x) (*New in PyTango 8.0*)
	Numpy	`numpy.ndarray` (dtype= `numpy.uint8`)	`numpy.ndarray` (dtype= `numpy.uint8`)
DEVVAR_CHARARRAY	Bytes	`bytes` (which is in fact equal to `str`)	`bytes`
	ByteArray	`bytearray`	`bytearray`
	String	`str`	String `str` (decoded with default python encoding *utf-8*!!!)
	List	`list` <`int`>	`list` <`int`>
	Tuple	`tuple` <`int`>	`tuple` <`int`>
	Numpy	`numpy.ndarray` (dtype= `numpy.uint16`)	`numpy.ndarray` (dtype= `numpy.uint16`)
DEVVAR_SHORTARRAY or (DEV_SHORT + SPECTRUM) or (DEV_SHORT + IMAGE)	Bytes	`bytes` (which is in fact equal to `str`)	`bytes`
	ByteArray	`bytearray`	`bytearray`
	String	`str`	String `str` (decoded with default python encoding *utf-8*!!!)
	List	`list` <`int`>	`list` <`int`>

Continued on next page

Table 5.1 – continued from previous page

Tango data type	ExtractAs	Data type (Python 2.x)	Data type (Python 3.x) (*New in PyTango 8.0*)
	Tuple	`tuple` <`int`>	`tuple` <`int`>
DEVVAR_LONGARRAY or (DEV_LONG + SPECTRUM) or (DEV_LONG + IMAGE)	Numpy	`numpy.ndarray` (dtype= `numpy.uint32`)	`numpy.ndarray` (dtype= `numpy.uint32`)
	Bytes	`bytes` (which is in fact equal to `str`)	`bytes`
	ByteArray	`bytearray`	`bytearray`
	String	`str`	String `str` (decoded with default python encoding *utf-8*!!!)
	List	`list` <`int`>	`list` <`int`>
	Tuple	`tuple` <`int`>	`tuple` <`int`>
DEVVAR_LONG64ARRAY or (DEV_LONG64 + SPECTRUM) or (DEV_LONG64 + IMAGE)	Numpy	`numpy.ndarray` (dtype= `numpy.uint64`)	`numpy.ndarray` (dtype= `numpy.uint64`)
	Bytes	`bytes` (which is in fact equal to `str`)	`bytes`
	ByteArray	`bytearray`	`bytearray`
	String	`str`	String `str` (decoded with default python encoding *utf-8*!!!)
	List	`list` <int (64 bits) / long (32 bits)>	`list` <`int`>
	Tuple	`tuple` <int (64 bits) / long (32 bits)>	`tuple` <`int`>
DEVVAR_FLOATARRAY or (DEV_FLOAT + SPECTRUM) or (DEV_FLOAT + IMAGE)	Numpy	`numpy.ndarray` (dtype= `numpy.float32`)	`numpy.ndarray` (dtype= `numpy.float32`)
	Bytes	`bytes` (which is in fact equal to `str`)	`bytes`
	ByteArray	`bytearray`	`bytearray`
	String	`str`	String `str` (decoded with default python encoding *utf-8*!!!)
	List	`list` <`float`>	`list` <`float`>
	Tuple	`tuple` <`float`>	`tuple` <`float`>
DEVVAR_DOUBLEARRAY or (DEV_DOUBLE + SPECTRUM) or (DEV_DOUBLE + IMAGE)	Numpy	`numpy.ndarray` (dtype= `numpy.float64`)	`numpy.ndarray` (dtype= `numpy.float64`)
	Bytes	`bytes` (which is in fact equal to `str`)	`bytes`
	ByteArray	`bytearray`	`bytearray`
	String	`str`	String `str` (decoded with default python encoding *utf-8*!!!)
	List	`list` <`float`>	`list` <`float`>
	Tuple	`tuple` <`float`>	`tuple` <`float`>
DEVVAR_USHORTARRAY or (DEV_USHORT + SPECTRUM) or (DEV_USHORT + IMAGE)	Numpy	`numpy.ndarray` (dtype= `numpy.uint16`)	`numpy.ndarray` (dtype= `numpy.uint16`)
	Bytes	`bytes` (which is in fact equal to `str`)	`bytes`
	ByteArray	`bytearray`	`bytearray`

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Table 5.1 – continued from previous page

Tango data type	ExtractAs	Data type (Python 2.x)	Data type (Python 3.x) (*New in PyTango 8.0*)
	String	`str`	String `str` (decoded with default python encoding *utf-8*!!!)
	List	`list` <`int`>	`list` <`int`>
	Tuple	`tuple` <`int`>	`tuple` <`int`>
DEVVAR_ULONGARRAY or (DEV_ULONG + SPECTRUM) or (DEV_ULONG + IMAGE)	Numpy	`numpy.ndarray` (dtype= `numpy.uint32`)	`numpy.ndarray` (dtype= `numpy.uint32`)
	Bytes	`bytes` (which is in fact equal to `str`)	`bytes`
	ByteArray	`bytearray`	`bytearray`
	String	`str`	String `str` (decoded with default python encoding *utf-8*!!!)
	List	`list` <`int`>	`list` <`int`>
	Tuple	`tuple` <`int`>	`tuple` <`int`>
DEVVAR_ULONG64ARRAY or (DEV_ULONG64 + SPECTRUM) or (DEV_ULONG64 + IMAGE)	Numpy	`numpy.ndarray` (dtype= `numpy.uint64`)	`numpy.ndarray` (dtype= `numpy.uint64`)
	Bytes	`bytes` (which is in fact equal to `str`)	`bytes`
	ByteArray	`bytearray`	`bytearray`
	String	`str`	String `str` (decoded with default python encoding *utf-8*!!!)
	List	`list` <int (64 bits) / long (32 bits)>	`list` <`int`>
	Tuple	`tuple` <int (64 bits) / long (32 bits)>	`tuple` <`int`>
DEVVAR_STRINGARRAY or (DEV_STRING + SPECTRUM) or (DEV_STRING + IMAGE)		sequence<`str`>	sequence<`str`> (decoded with *latin-1*, aka *ISO-8859-1*)
DEV_LONGSTRINGARRAY		sequence of two elements: 0. `numpy.ndarray` (dtype= `numpy.int32`) or sequence<`int`> 1. sequence<`str`>	sequence of two elements: 0. `numpy.ndarray` (dtype= `numpy.int32`) or sequence<`int`> 1. sequence<`str`> (decoded with *latin-1*, aka *ISO-8859-1*)

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Table 5.1 – continued from previous page

Tango data type	ExtractAs	Data type (Python 2.x)	Data type (Python 3.x) (*New in PyTango 8.0*)
DEV_DOUBLESTRINGARRAY		sequence of two elements: 0. `numpy.ndarray` (dtype= `numpy.float64`) or sequence<`int`> 1. sequence<`str`>	sequence of two elements: 0. `numpy.ndarray` (dtype= `numpy.float64`) or sequence<`int`> 1. sequence<`str`> (decoded with *latin-1*, aka *ISO-8859-1*)

For SPECTRUM and IMAGES the actual sequence object used depends on the context where the tango data is used, and the availability of `numpy`.

1. for properties the sequence is always a `list`. Example:

```
>>> import PyTango
>>> db = PyTango.Database()
>>> s = db.get_property(["TangoSynchrotrons"])
>>> print type(s)
<type 'list'>
```

2. **for attribute/command values**

   - `numpy.ndarray` if PyTango was compiled with `numpy` support (default) and `numpy` is installed.
   - `list` otherwise

5.2 Client API

5.2.1 DeviceProxy

class `PyTango.`**`DeviceProxy`**`(`**args, **kwargs*`)`

Bases: `PyTango._PyTango.Connection`

DeviceProxy is the high level Tango object which provides the client with an easy-to-use interface to TANGO devices. DeviceProxy provides interfaces to all TANGO Device interfaces.The DeviceProxy manages timeouts, stateless connections and reconnection if the device server is restarted. To create a DeviceProxy, a Tango Device name must be set in the object constructor.

Example : dev = PyTango.DeviceProxy("sys/tg_test/1")

DeviceProxy(dev_name, green_mode=None, wait=True, timeout=True) -> DeviceProxy DeviceProxy(self, dev_name, need_check_acc, green_mode=None, wait=True, timeout=True) -> DeviceProxy

Creates a new `DeviceProxy`.

Parameters

- **`dev_name`** (*str*) – the device name or alias
- **`need_check_acc`** (*bool*) – in first version of the function it defaults to True. Determines if at creation time of DeviceProxy it should check for channel access (rarely used)

- **green_mode** (`GreenMode`) – determines the mode of execution of the device (including. the way it is created). Defaults to the current global green_mode (check `get_green_mode()` and `set_green_mode()`)
- **wait** (*bool*) – whether or not to wait for result. If green_mode Ignored when green_mode is Synchronous (always waits).
- **timeout** (*float*) – The number of seconds to wait for the result. If None, then there is no limit on the wait time. Ignored when green_mode is Synchronous or wait is False.

Returns

if green_mode is Synchronous or wait is True: `DeviceProxy`

elif green_mode is Futures: `concurrent.futures.Future`

elif green_mode is Gevent: `gevent.event.AsynchResult`

Throws

- : class:~*PyTango.DevFailed* if green_mode is Synchronous or wait is True and there is an error creating the device.
- : class:*concurrent.futures.TimeoutError* if green_mode is Futures, wait is False, timeout is not None and the time to create the device has expired.
- : class:*gevent.timeout.Timeout* if green_mode is Gevent, wait is False, timeout is not None and the time to create the device has expired.

New in version 8.1.0: *green_mode* parameter. *wait* parameter. *timeout* parameter.

`add_logging_target`(*self*, *target_type_target_name*) → None

Adds a new logging target to the device.

The target_type_target_name input parameter must follow the format: target_type::target_name. Supported target types are: console, file and device. For a device target, the target_name part of the target_type_target_name parameter must contain the name of a log consumer device (as defined in A.8). For a file target, target_name is the full path to the file to log to. If omitted, the device's name is used to build the file name (which is something like domain_family_member.log). Finally, the target_name part of the target_type_target_name input parameter is ignored in case of a console target and can be omitted.

Parameters

target_type_target_name (`str`) logging target

Return None

Throws `DevFailed` from device

New in PyTango 7.0.0

`adm_name`(*self*) → str

Return the name of the corresponding administrator device. This is useful if you need to send an administration command to the device server, e.g restart it

New in PyTango 3.0.4

`alias`(*self*) → str

Return the device alias if one is defined. Otherwise, throws exception.

Return (`str`) device alias

attribute_history(*self*, *attr_name*, *depth*, *extract_as=ExtractAs.Numpy*) → sequence<DeviceAttributeHistory>

Retrieve attribute history from the attribute polling buffer. See chapter on Advanced Feature for all details regarding polling

Parameters

attr_name (`str`) Attribute name.

depth (`int`) The wanted history depth.

extract_as (`ExtractAs`)

Return This method returns a vector of DeviceAttributeHistory types.

Throws `NonSupportedFeature`, `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device

attribute_list_query(*self*) → sequence<AttributeInfo>

Query the device for info on all attributes. This method returns a sequence of PyTango.AttributeInfo.

Parameters None

Return (sequence<`AttributeInfo`>) containing the attributes configuration

Throws `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device

attribute_list_query_ex(*self*) → sequence<AttributeInfoEx>

Query the device for info on all attributes. This method returns a sequence of PyTango.AttributeInfoEx.

Parameters None

Return (sequence<`AttributeInfoEx`>) containing the attributes configuration

Throws `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device

attribute_query(*self*, *attr_name*) → AttributeInfoEx

Query the device for information about a single attribute.

Parameters

attr_name (`str`) the attribute name

Return (`AttributeInfoEx`) containing the attribute configuration

Throws `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device

black_box(*self*, *n*) → sequence<str>

Get the last commands executed on the device server

Parameters

n n number of commands to get

Return (sequence<`str`>) sequence of strings containing the date, time, command and from which client computer the command was executed

Example

```
print(black_box(4))
```

cancel_all_polling_asynch_request (*self*) → None

Cancel all running asynchronous request

This is a client side call. Obviously, the calls cannot be aborted while it is running in the device.

Parameters None

Return None

New in PyTango 7.0.0

cancel_asynch_request (*self*, *id*) → None

Cancel a running asynchronous request

This is a client side call. Obviously, the call cannot be aborted while it is running in the device.

Parameters

id The asynchronous call identifier

Return None

New in PyTango 7.0.0

command_history (*self*, *cmd_name*, *depth*) → sequence<DeviceDataHistory>

Retrieve command history from the command polling buffer. See chapter on Advanced Feature for all details regarding polling

Parameters

cmd_name (`str`) Command name.

depth (`int`) The wanted history depth.

Return This method returns a vector of DeviceDataHistory types.

Throws `NonSupportedFeature`, `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device

command_inout (*self*, *cmd_name*, *cmd_param=None*, *green_mode=None*, *wait=True*, *timeout=None*) → any

Execute a command on a device.

Parameters

cmd_name (`str`) Command name.

cmd_param (`any`) It should be a value of the type expected by the command or a DeviceData object with this value inserted. It can be ommited if the command should not get any argument.

green_mode (`GreenMode`) Defaults to the current DeviceProxy GreenMode. (see `get_green_mode()` and `set_green_mode()`).

wait (`bool`) whether or not to wait for result. If green_mode is *Synchronous*, this parameter is ignored as it always waits for the result. Ignored when green_mode is Synchronous (always waits).

timeout (`float`) The number of seconds to wait for the result. If None, then there is no limit on the wait time. Ignored when green_mode is Synchronous or wait is False.

Return The result of the command. The type depends on the command. It may be None.

Throws `ConnectionFailed`, `CommunicationFailed`, `DeviceUnlocked`, `DevFailed` from device TimeoutError (green_mode == Futures) If the future didn't finish executing before the given timeout. Timeout (green_mode == Gevent) If the async result didn't finish executing before the given timeout.

New in version 8.1.0: *green_mode* parameter. *wait* parameter. *timeout* parameter.

`command_inout_asynch`(*self*, *cmd_name*) → id

command_inout_asynch *(self, cmd_name, cmd_param)* **->** `id`

command_inout_asynch *(self, cmd_name, cmd_param, forget)* **->** `id`

Execute asynchronously (polling model) a command on a device

Parameters

cmd_name (`str`) Command name.

cmd_param (`any`) It should be a value of the type expected by the command or a DeviceData object with this value inserted. It can be ommited if the command should not get any argument. If the command should get no argument and you want to set the 'forget' param, use None for cmd_param.

forget (`bool`) If this flag is set to true, this means that the client does not care at all about the server answer and will even not try to get it. Default value is False. Please, note that device re-connection will not take place (in case it is needed) if the fire and forget mode is used. Therefore, an application using only fire and forget requests is not able to automatically re-connnect to device.

Return (`int`) This call returns an asynchronous call identifier which is needed to get the command result (see command_inout_reply)

Throws `ConnectionFailed`, TypeError, anything thrown by command_query

command_inout_asynch(self, cmd_name, `callback`) -> None

command_inout_asynch(self, cmd_name, cmd_param, `callback`) -> None

Execute asynchronously (`callback` model) a command on a device.

Parameters

cmd_name (`str`) Command name.

cmd_param (any)It should be a value of the type expected by the command or a DeviceData object with this value inserted. It can be ommited if the command should not get any argument.

callback Any callable object (function, lambda...) or any oject with a method named "cmd_ended".

Return None

Throws `ConnectionFailed`, TypeError, anything thrown by command_query

`command_inout_raw`(*self*, *cmd_name*, *cmd_param=None*) → DeviceData

Execute a command on a device.

Parameters

cmd_name (`str`) Command name.

cmd_param (`any`) It should be a value of the type expected by the command or a DeviceData object with this value inserted. It can be ommited if the command should not get any argument.

Return A DeviceData object.

Throws `ConnectionFailed`, `CommunicationFailed`, `DeviceUnlocked`, `DevFailed` from device

`command_inout_reply`(*self*, *id*) → DeviceData

Check if the answer of an asynchronous command_inout is arrived (polling model). If the reply is arrived and if it is a valid reply, it is returned to the caller in a DeviceData object. If the reply is an exception, it is re-thrown by this call. An exception is also thrown in case of the reply is not yet arrived.

Parameters

id (`int`) Asynchronous call identifier.

Return (`DeviceData`)

Throws `AsynCall`, `AsynReplyNotArrived`, `CommunicationFailed`, `DevFailed` from device

command_inout_reply(self, id, timeout) -> `DeviceData`

Check if the answer of an asynchronous command_inout is arrived (polling model). id is the asynchronous call identifier. If the reply is arrived and if it is a valid reply, it is returned to the caller in a `DeviceData` object. If the reply is an `exception`, it is re-thrown by this call. If the reply is not yet arrived, the call will wait (blocking the process) for the time specified in timeout. If after timeout milliseconds, the reply is still not there, an `exception` is thrown. If timeout is set to 0, the call waits until the reply arrived.

Parameters

id (`int`) Asynchronous call identifier.

timeout (`int`)

Return (`DeviceData`)

Throws `AsynCall`, `AsynReplyNotArrived`, `CommunicationFailed`, `DevFailed` from device

`command_inout_reply_raw`(*self*, *id*, *timeout*) → DeviceData

Check if the answer of an asynchronous command_inout is arrived (polling model). id is the asynchronous call identifier. If the reply is arrived and if it is a valid reply, it is returned to the caller in a DeviceData object. If the reply is an exception, it is re-thrown by this call. If the reply is not yet arrived, the call will wait (blocking the process) for the time specified in timeout. If after timeout milliseconds, the reply is still not there, an exception is thrown. If timeout is set to 0, the call waits until the reply arrived.

Parameters

id (`int`) Asynchronous call identifier.

timeout (`int`)

Return (`DeviceData`)

Throws `AsynCall`, `AsynReplyNotArrived`, `CommunicationFailed`, `DevFailed` from device

command_inout_reply_raw(self, id) -> `DeviceData`

Check if the answer of an asynchronous command_inout is arrived (polling model). If the reply is arrived and if it is a valid reply, it is returned to the caller in a `DeviceData` object. If the reply is an `exception`, it is re-thrown by this call. An `exception` is also thrown in case of the reply is not yet arrived.

Parameters

id (`int`) Asynchronous call identifier.

Return (`DeviceData`)

Throws `AsynCall`, `AsynReplyNotArrived`, `CommunicationFailed`, `DevFailed` from device

`command_list_query` (*self*) → sequence<CommandInfo>

Query the device for information on all commands.

Parameters None

Return (`CommandInfoList`) Sequence of CommandInfo objects

`command_query` (*self*, *command*) → CommandInfo

Query the device for information about a single command.

Parameters

command (`str`) command name

Return (`CommandInfo`) object

Throws `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device

Example

```
com_info = dev.command_query(""DevString"")
print(com_info.cmd_name)
print(com_info.cmd_tag)
print(com_info.in_type)
print(com_info.out_type)
print(com_info.in_type_desc)
print(com_info.out_type_desc)
print(com_info.disp_level)
```

See CommandInfo documentation string form more detail

`connect` (*self*, *corba_name*) → None

Creates a connection to a TANGO device using it's stringified CORBA reference i.e. IOR or corbaloc.

Parameters

corba_name (`str`) Name of the CORBA object

Return None

New in PyTango 7.0.0

`delete_property` (*self*, *value*)

Delete a the given of properties for this device. This method accepts the following types as value parameter:

1.string [in] - single property to be deleted

2.PyTango.DbDatum [in] - single property data to be deleted

3.PyTango.DbData [in] - several property data to be deleted

4.sequence<string> [in]- several property data to be deleted

5.sequence<DbDatum> [in] - several property data to be deleted

6.dict<str, obj> [in] - keys are property names to be deleted (values are ignored)

7.dict<str, DbDatum> [in] - several DbDatum.name are property names to be deleted (keys are ignored)

Parameters

value can be one of the following:

1. string [in] - single property data to be deleted
2. PyTango.DbDatum [in] - single property data to be deleted
3. PyTango.DbData [in] - several property data to be deleted
4. sequence<string> [in]- several property data to be deleted
5. sequence<DbDatum> [in] - several property data to be deleted
6. dict<str, obj> [in] - keys are property names to be deleted (values are ignored)
7. dict<str, DbDatum> [in] - several DbDatum.name are property names to be deleted (keys are ignored)

Return None

Throws `ConnectionFailed`, `CommunicationFailed` `DevFailed` from device (DB_SQLError)

`description` (*self*) → str

Get device description.

Parameters None

Return (`str`) describing the device

`event_queue_size` (*self*, *event_id*) → int

Returns the number of stored events in the event reception buffer. After every call to DeviceProxy.get_events(), the event queue size is 0. During event subscription the client must have chosen the 'pull model' for this event. event_id is the event identifier returned by the DeviceProxy.subscribe_event() method.

Parameters

event_id (`int`) event identifier

Return an integer with the queue size

Throws `EventSystemFailed`

New in PyTango 7.0.0

`get_access_control`(*self*) → AccessControlType

Returns the current access control type

Parameters None

Return (`AccessControlType`) The current access control type

New in PyTango 7.0.0

`get_access_right`(*self*) → AccessControlType

Returns the current access control type

Parameters None

Return (`AccessControlType`) The current access control type

New in PyTango 8.0.0

`get_asynch_replies`(*self*, *call_timeout*) → None

Try to obtain data returned by a command asynchronously requested. This method blocks for the specified timeout if the reply is not yet arrived. This method fires callback when the reply arrived. If the timeout is set to 0, the call waits undefinitely for the reply

Parameters

call_timeout (`int`) timeout in miliseconds

Return None

New in PyTango 7.0.0

get_asynch_replies *(self)* **->** `None`

Try to obtain data returned by a command asynchronously requested. This method does not block if the reply has not yet arrived. It fires callback for already arrived replies.

Parameters None

Return None

New in PyTango 7.0.0

`get_attribute_config`(*self*, *name*) → AttributeInfoEx

Return the attribute configuration for a single attribute.

Parameters

name (`str`) attribute name

Return (`AttributeInfoEx`) Object containing the attribute information

Throws `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device

Deprecated: use get_attribute_config_ex instead

get_attribute_config(self, names) -> `AttributeInfoList`

Return the attribute configuration for the list of specified attributes. To get all the attributes pass a sequence containing the constant PyTango.:class:*constants*.AllAttr

Parameters

names (sequence<`str`>) attribute names

Return (`AttributeInfoList`) Object containing the attributes information

Throws `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device

Deprecated: use get_attribute_config_ex instead

`get_attribute_config_ex`(*self*, *name*) → AttributeInfoListEx :

Return the extended attribute configuration for a single attribute.

Parameters

name (`str`) attribute name

Return (`AttributeInfoEx`) Object containing the attribute information

Throws `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device

get_attribute_config(self, names) -> `AttributeInfoListEx` :

Return the extended attribute configuration for the list of specified attributes. To get all the attributes pass a sequence containing the constant PyTango.:class:*constants*.AllAttr

Parameters

names (sequence<`str`>) attribute names

Return (`AttributeInfoList`) Object containing the attributes information

Throws `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device

`get_attribute_list`(*self*) → sequence<str>

Return the names of all attributes implemented for this device.

Parameters None

Return sequence<str>

Throws `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device

`get_attribute_poll_period`(*self*, *attr_name*) → int

Return the attribute polling period.

Parameters

attr_name (`str`) attribute name

Return polling period in milliseconds

get_command_poll_period(*self*, *cmd_name*) → int

Return the command polling period.

Parameters

cmd_name (`str`) command name

Return polling period in milliseconds

get_db_host(*self*) → str

Returns a string with the database host.

Parameters None

Return (`str`)

New in PyTango 7.0.0

get_db_port(*self*) → str

Returns a string with the database port.

Parameters None

Return (`str`)

New in PyTango 7.0.0

get_db_port_num(*self*) → int

Returns an integer with the database port.

Parameters None

Return (`int`)

New in PyTango 7.0.0

get_dev_host(*self*) → str

Returns the current host

Parameters None

Return (`str`) the current host

New in PyTango 7.2.0

get_dev_port(*self*) → str

Returns the current port

Parameters None

Return (`str`) the current port

New in PyTango 7.2.0

get_device_db(*self*) → Database

Returns the internal database reference

Parameters None

Return (`Database`) object

New in PyTango 7.0.0

get_events(*event_id*, *callback=None*, *extract_as=Numpy*) → None

The method extracts all waiting events from the event reception buffer.

If callback is not None, it is executed for every event. During event subscription the client must have chosen the pull model for this event. The callback will receive a parameter of type EventData, AttrConfEventData or DataReadyEventData depending on the type of the event (event_type parameter of subscribe_event).

If callback is None, the method extracts all waiting events from the event reception buffer. The returned event_list is a vector of EventData, AttrConfEventData or DataReadyEvent-Data pointers, just the same data the callback would have received.

Parameters

- **event_id** (`int`) is the event identifier returned by the Device-Proxy.subscribe_event() method.
- **callback** (`callable`) Any callable object or any object with a "push_event" method.
- **extract_as** (`ExtractAs`)

Return None

Throws `EventSystemFailed`

See Also subscribe_event

New in PyTango 7.0.0

get_fqdn(*self*) → str

Returns the fully qualified domain name

Parameters None

Return (`str`) the fully qualified domain name

New in PyTango 7.2.0

get_from_env_var(*self*) → bool

Returns True if determined by environment variable or False otherwise

Parameters None

Return (`bool`)

New in PyTango 7.0.0

get_green_mode()

Returns the green mode in use by this DeviceProxy.

Returns the green mode in use by this DeviceProxy.

Return type GreenMode

See also:

`PyTango.get_green_mode()` `PyTango.set_green_mode()`

New in PyTango 8.1.0

get_idl_version(*self*) → int

Get the version of the Tango Device interface implemented by the device

Parameters None

Return (`int`)

`get_last_event_date`(*self*, *event_id*) → TimeVal

Returns the arrival time of the last event stored in the event reception buffer. After every call to DeviceProxy:get_events(), the event reception buffer is empty. In this case an exception will be returned. During event subscription the client must have chosen the 'pull model' for this event. event_id is the event identifier returned by the DeviceProxy.subscribe_event() method.

Parameters

event_id (`int`) event identifier

Return (`PyTango.TimeVal`) representing the arrival time

Throws `EventSystemFailed`

New in PyTango 7.0.0

`get_locker`(*self*, *lockinfo*) → bool

If the device is locked, this method returns True an set some locker process informations in the structure passed as argument. If the device is not locked, the method returns False.

Parameters

lockinfo [out] (`PyTango.LockInfo`) object that will be filled with lock informantion

Return (`bool`) True if the device is locked by us. Otherwise, False

New in PyTango 7.0.0

`get_logging_level`(*self*) → int

Returns the current device's logging level, where:

- 0=OFF
- 1=FATAL
- 2=ERROR
- 3=WARNING
- 4=INFO
- 5=DEBUG

:Parameters:None :Return: (`int`) representing the current logging level

New in PyTango 7.0.0

`get_logging_target`(*self*) → sequence<str>

Returns a sequence of string containing the current device's logging targets. Each vector element has the following format: target_type::target_name. An empty sequence is returned is the device has no logging targets.

Parameters None

Return a squence<str> with the logging targets

New in PyTango 7.0.0

`get_property`(*propname*, *value=None*) → PyTango.DbData

Get a (list) property(ies) for a device.

This method accepts the following types as propname parameter: 1. string [in] - single property data to be fetched 2. sequence<string> [in] - several property data to be fetched 3. PyTango.DbDatum [in] - single property data to be fetched 4. PyTango.DbData [in,out] - several property data to be fetched. 5. sequence<DbDatum> - several property data to be feteched

Note: for cases 3, 4 and 5 the 'value' parameter if given, is IGNORED.

If value is given it must be a PyTango.DbData that will be filled with the property values

Parameters

- **propname** (`any`) property(ies) name(s)
- **value** (`DbData`) (optional, default is None meaning that the method will create internally a PyTango.DbData and return it filled with the property values

Return (`DbData`) object containing the property(ies) value(s). If a PyTango.DbData is given as parameter, it returns the same object otherwise a new PyTango.DbData is returned

Throws `NonDbDevice`, `ConnectionFailed` (with database), `CommunicationFailed` (with database), `DevFailed` from database device

`get_property_list`(*self*, *filter*, *array=None*) → obj

Get the list of property names for the device. The parameter filter allows the user to filter the returned name list. The wildcard character is '*'. Only one wildcard character is allowed in the filter parameter.

Parameters

- **filter[in]** (`str`) the filter wildcard
- **array[out]** (sequence obj or None) (optional, default is None) an array to be filled with the property names. If None a new list will be created internally with the values.

Return the given array filled with the property names (or a new list if array is None)

Throws `NonDbDevice`, `WrongNameSyntax`, `ConnectionFailed` (with database), `CommunicationFailed` (with database) `DevFailed` from database device

New in PyTango 7.0.0

`get_source`(*self*) → DevSource

Get the data source(device, polling buffer, polling buffer then device) used by command_inout or read_attribute methods

Parameters None

Return (`DevSource`)

Example

```
source = dev.get_source()
if source == DevSource.CACHE_DEV : ...
```

get_tango_lib_version (*self*) → int

Returns the Tango lib version number used by the remote device Otherwise, throws exception.

Return (int) The device Tango lib version as a 3 or 4 digits number. Possible return value are: 100,200,500,520,700,800,810,...

New in PyTango 8.1.0

get_timeout_millis (*self*) → int

Get the client side timeout in milliseconds

Parameters None

Return (int)

get_transparency_reconnection (*self*) → bool

Returns the device transparency reconnection flag.

Parameters None

Return (bool) True if transparency reconnection is set or False otherwise

import_info (*self*) → DbDevImportInfo

Query the device for import info from the database.

Parameters None

Return (DbDevImportInfo)

Example

```
dev_import = dev.import_info()
print(dev_import.name)
print(dev_import.exported)
print(dev_ior.ior)
print(dev_version.version)
```

All DbDevImportInfo fields are strings except for exported which is an integer"

info (*self*) → DeviceInfo

A method which returns information on the device

Parameters None

Return (DeviceInfo) object

Example

```
    dev_info = dev.info()
    print(dev_info.dev_class)
    print(dev_info.server_id)
    print(dev_info.server_host)
    print(dev_info.server_version)
    print(dev_info.doc_url)
    print(dev_info.dev_type)
```

```
All DeviceInfo fields are strings except for the server_version
which is an integer"
```

is_attribute_polled(*self*, *attr_name*) → bool

True if the attribute is polled.

Parameters

attr_name (`str`) attribute name

Return boolean value

is_command_polled(*self*, *cmd_name*) → bool

True if the command is polled.

Parameters

cmd_name (`str`) command name

Return boolean value

is_dbase_used(*self*) → bool

Returns if the database is being used

Parameters None

Return (`bool`) True if the database is being used

New in PyTango 7.2.0

is_event_queue_empty(*self*, *event_id*) → bool

Returns true when the event reception buffer is empty. During event subscription the client must have chosen the 'pull model' for this event. event_id is the event identifier returned by the DeviceProxy.subscribe_event() method.

Parameters

event_id (`int`) event identifier

Return (`bool`) True if queue is empty or False otherwise

Throws `EventSystemFailed`

New in PyTango 7.0.0

is_locked(*self*) → bool

Returns True if the device is locked. Otherwise, returns False.

Parameters None

Return (`bool`) True if the device is locked. Otherwise, False

New in PyTango 7.0.0

is_locked_by_me(*self*) → bool

Returns True if the device is locked by the caller. Otherwise, returns False (device not locked or locked by someone else)

Parameters None

Return (`bool`) True if the device is locked by us. Otherwise, False

New in PyTango 7.0.0

lock(*self, (int)lock_validity*) → None

Lock a device. The lock_validity is the time (in seconds) the lock is kept valid after the previous lock call. A default value of 10 seconds is provided and should be fine in most cases. In case it is necessary to change the lock validity, it's not possible to ask for a validity less than a minimum value set to 2 seconds. The library provided an automatic system to periodically re lock the device until an unlock call. No code is needed to start/stop this automatic re-locking system. The locking system is re-entrant. It is then allowed to call this method on a device already locked by the same process. The locking system has the following features:

- It is impossible to lock the database device or any device server process admin device
- Destroying a locked DeviceProxy unlocks the device
- Restarting a locked device keeps the lock
- It is impossible to restart a device locked by someone else
- Restarting a server breaks the lock

A locked device is protected against the following calls when executed by another client:

- command_inout call except for device state and status requested via command and for the set of commands defined as allowed following the definition of allowed command in the Tango control access schema.
- write_attribute call
- write_read_attribute call
- set_attribute_config call

Parameters

lock_validity (`int`) lock validity time in seconds (optional, default value is PyTango.constants.DEFAULT_LOCK_VALIDITY)

Return None

New in PyTango 7.0.0

locking_status(*self*) → str

This method returns a plain string describing the device locking status. This string can be:

- 'Device <device name> is not locked' in case the device is not locked
- 'Device <device name> is locked by CPP or Python client with PID <pid> from host <host name>' in case the device is locked by a CPP client
- 'Device <device name> is locked by JAVA client class <main class> from host <host name>' in case the device is locked by a JAVA client

Parameters None

Return a string representing the current locking status

New in PyTango 7.0.0"

name(*self*) → str

Return the device name from the device itself.

pending_asynch_call(*self*) → int

Return number of device asynchronous pending requests"

New in PyTango 7.0.0

ping(*self*) → int

A method which sends a ping to the device

Parameters None

Return (`int`) time elapsed in microseconds

Throws `exception` if device is not alive

poll_attribute(*self, attr_name, period*) → None

Add an attribute to the list of polled attributes.

Parameters

attr_name (`str`) attribute name

period (`int`) polling period in milliseconds

Return None

poll_command(*self, cmd_name, period*) → None

Add a command to the list of polled commands.

Parameters

cmd_name (`str`) command name

period (`int`) polling period in milliseconds

Return None

polling_status(*self*) → sequence<str>

Return the device polling status.

Parameters None

Return (sequence<`str`>) One string for each polled command/attribute. Each string is multi-line string with:

- attribute/command name
- attribute/command polling period in milliseconds
- attribute/command polling ring buffer
- time needed for last attribute/command execution in milliseconds
- time since data in the ring buffer has not been updated
- delta time between the last records in the ring buffer
- exception parameters in case of the last execution failed

put_property(*self, value*) → None

Insert or update a list of properties for this device. This method accepts the following types as value parameter: 1. PyTango.DbDatum - single property data to be inserted 2. PyTango.DbData - several property data to be inserted 3. sequence<DbDatum> - several property data to be inserted 4. dict<str, DbDatum> - keys are property names and value has data to be inserted 5. dict<str, seq<str>> - keys are property names and value has data to be inserted 6. dict<str, obj> - keys are property names and str(obj) is property value

Parameters

value can be one of the following: 1. PyTango.DbDatum - single property data to be inserted 2. PyTango.DbData - several property data to be inserted 3. sequence<DbDatum> - several property data to be inserted 4. dict<str, DbDatum> - keys are property names and value has data to be inserted 5. dict<str, seq<str>> - keys are property names and value has data to be inserted 6. dict<str, obj> - keys are property names and str(obj) is property value

Return None

Throws `ConnectionFailed`, `CommunicationFailed` `DevFailed` from device (DB_SQLError)

`read_attribute`(*self*, *attr_name*, *extract_as=ExtractAs.Numpy*, *green_mode=None*, *wait=True*, *timeout=None*) → DeviceAttribute

Read a single attribute.

Parameters

attr_name (`str`) The name of the attribute to read.

extract_as (`ExtractAs`) Defaults to numpy.

green_mode (`GreenMode`) Defaults to the current DeviceProxy GreenMode. (see `get_green_mode()` and `set_green_mode()`).

wait (`bool`) whether or not to wait for result. If green_mode is *Synchronous*, this parameter is ignored as it always waits for the result. Ignored when green_mode is Synchronous (always waits).

timeout (`float`) The number of seconds to wait for the result. If None, then there is no limit on the wait time. Ignored when green_mode is Synchronous or wait is False.

Return (`DeviceAttribute`)

Throws `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device TimeoutError (green_mode == Futures) If the future didn't finish executing before the given timeout. Timeout (green_mode == Gevent) If the async result didn't finish executing before the given timeout.

Changed in version 7.1.4: For `DevEncoded` attributes, before it was returning a `DeviceAttribute`.value as a tuple **(format<str>, data<str>)** no matter what was the *extract_as* value was. Since 7.1.4, it returns a **(format<str>, data<buffer>)** unless *extract_as* is String, in which case it returns **(format<str>, data<str>)**.

Changed in version 8.0.0: For `DevEncoded` attributes, now returns a `DeviceAttribute`.value as a tuple **(format<str>, data<bytes>)** unless *extract_as* is String, in which case it returns **(format<str>, data<str>)**. Carefull, if using python >= 3 data<str> is decoded using default python *utf-8* encoding. This means that PyTango assumes tango DS was written encapsulating string into *utf-8* which is the default python encoding.

New in version 8.1.0: *green_mode* parameter. *wait* parameter. *timeout* parameter.

`read_attribute_asynch`(*self*, *attr_name*) → int
read_attribute_asynch *(self, attr_name, callback)* **->** `None`

Shortcut to self.read_attributes_asynch([attr_name], cb)

New in PyTango 7.0.0

`read_attribute_reply`(*self, id, extract_as*) → int

read_attribute_reply *(self, id, timeout, extract_as)* **->** `None`

Shortcut to self.read_attributes_reply()[0]

New in PyTango 7.0.0

`read_attributes`(*self, attr_names, extract_as=ExtractAs.Numpy, green_mode=None, wait=True, timeout=None*) → sequence<DeviceAttribute>

Read the list of specified attributes.

Parameters

attr_names (sequence<`str`>) A list of attributes to read.

extract_as (`ExtractAs`) Defaults to numpy.

green_mode (`GreenMode`) Defaults to the current DeviceProxy GreenMode. (see `get_green_mode()` and `set_green_mode()`).

wait (`bool`) whether or not to wait for result. If green_mode is *Synchronous*, this parameter is ignored as it always waits for the result. Ignored when green_mode is Synchronous (always waits).

timeout (`float`) The number of seconds to wait for the result. If None, then there is no limit on the wait time. Ignored when green_mode is Synchronous or wait is False.

Return (sequence<`DeviceAttribute`>)

Throws `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device TimeoutError (green_mode == Futures) If the future didn't finish executing before the given timeout. Timeout (green_mode == Gevent) If the async result didn't finish executing before the given timeout.

New in version 8.1.0: *green_mode* parameter. *wait* parameter. *timeout* parameter.

`read_attributes_asynch`(*self, attr_names*) → int

Read asynchronously (polling model) the list of specified attributes.

Parameters

attr_names (sequence<`str`>) A list of attributes to read. It should be a StdStringVector or a sequence of str.

Return an asynchronous call identifier which is needed to get attributes value.

Throws `ConnectionFailed`

New in PyTango 7.0.0

read_attributes_asynch *(self, attr_names, callback, extract_as=Numpy)* **->** `None`

Read asynchronously (callback model) an attribute list.

Parameters

attr_names (sequence<`str`>) A list of attributes to read. See read_attributes.

callback (`callable`) This callback object should be an instance of a user class with an attr_read() method. It can also be any callable object.

extract_as (`ExtractAs`) Defaults to numpy.

Return None

Throws `ConnectionFailed`

New in PyTango 7.0.0

`read_attributes_reply` (*self*, *id*, *extract_as=ExtractAs.Numpy*) → DeviceAttribute

Check if the answer of an asynchronous read_attribute is arrived (polling model).

Parameters

id (`int`) is the asynchronous call identifier.

extract_as (`ExtractAs`)

Return If the reply is arrived and if it is a valid reply, it is returned to the caller in a list of DeviceAttribute. If the reply is an exception, it is re-thrown by this call. An exception is also thrown in case of the reply is not yet arrived.

Throws `AsynCall`, `AsynReplyNotArrived`, `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device

New in PyTango 7.0.0

read_attributes_reply *(self, id, timeout, extract_as=ExtractAs.Numpy)* **->** `DeviceAttribute`

Check if the answer of an asynchronous read_attributes is arrived (polling model).

Parameters

id (`int`) is the asynchronous call identifier.

timeout (`int`)

extract_as (`ExtractAs`)

Return If the reply is arrived and if it is a valid reply, it is returned to the caller in a list of DeviceAttribute. If the reply is an exception, it is re-thrown by this call. If the reply is not yet arrived, the call will wait (blocking the process) for the time specified in timeout. If after timeout milliseconds, the reply is still not there, an exception is thrown. If timeout is set to 0, the call waits until the reply arrived.

Throws `AsynCall`, `AsynReplyNotArrived`, `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device

New in PyTango 7.0.0

`reconnect` (*self*, *db_used*) → None

Reconnecto to a CORBA object.

Parameters

db_used (`bool`) Use thatabase

Return None

New in PyTango 7.0.0

`remove_logging_target`(*self*, *target_type_target_name*) → None

Removes a logging target from the device's target list.

The target_type_target_name input parameter must follow the format: target_type::target_name. Supported target types are: console, file and device. For a device target, the target_name part of the target_type_target_name parameter must contain the name of a log consumer device (as defined in). For a file target, target_name is the full path to the file to remove. If omitted, the default log file is removed. Finally, the target_name part of the target_type_target_name input parameter is ignored in case of a console target and can be omitted. If target_name is set to '*', all targets of the specified target_type are removed.

Parameters

target_type_target_name (`str`) logging target

Return None

New in PyTango 7.0.0

`set_access_control`(*self*, *acc*) → None

Sets the current access control type

Parameters

acc (`AccessControlType`) the type of access control to set

Return None

New in PyTango 7.0.0

`set_attribute_config`(*self*, *attr_info*) → None

Change the attribute configuration for the specified attribute

Parameters

attr_info (`AttributeInfo`) attribute information

Return None

Throws `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device

set_attribute_config(self, attr_info_ex) -> None

Change the extended attribute configuration for the specified attribute

Parameters

attr_info_ex (`AttributeInfoEx`) extended attribute information

Return None

Throws `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device

set_attribute_config(self, attr_info) -> None

Change the attributes configuration for the specified attributes

Parameters

attr_info (sequence<`AttributeInfo`>) attributes information

Return None

Throws `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device

set_attribute_config(self, attr_info_ex) -> None

Change the extended attributes configuration for the specified attributes

Parameters

attr_info_ex (sequence<`AttributeInfoListEx`>) extended attributes information

Return None

Throws `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device

`set_green_mode`(*green_mode=None*)

Sets the green mode to be used by this DeviceProxy Setting it to None means use the global PyTango green mode (see `PyTango.get_green_mode()`).

Parameters **`green_mode`** (*GreenMode*) – the new green mode

New in PyTango 8.1.0

`set_logging_level`(*self*, *(int)level*) → None

Changes the device's logging level, where:

- 0=OFF
- 1=FATAL
- 2=ERROR
- 3=WARNING
- 4=INFO
- 5=DEBUG

Parameters

level (`int`) logging level

Return None

New in PyTango 7.0.0

`set_source`(*self*, *source*) → None

Set the data source(device, polling buffer, polling buffer then device) for command_inout and read_attribute methods.

Parameters

source (`DevSource`) constant.

Return None

Example

```
dev.set_source(DevSource.CACHE_DEV)
```

set_timeout_millis(*self*, *timeout*) → None

Set client side timeout for device in milliseconds. Any method which takes longer than this time to execute will throw an exception

Parameters

timeout integer value of timeout in milliseconds

Return None

Example

```
dev.set_timeout_millis(1000)
```

set_transparency_reconnection(*self*, *yesno*) → None

Set the device transparency reconnection flag

Parameters " - val : (bool) True to set transparency reconnection " or False otherwise

Return None

state(*self*) → DevState

A method which returns the state of the device.

Parameters None

Return (`DevState`) constant

Example

```
dev_st = dev.state()
if dev_st == DevState.ON : ...
```

status(*self*) → str

A method which returns the status of the device as a string.

Parameters None

Return (`str`) describing the device status

stop_poll_attribute(*self*, *attr_name*) → None

Remove an attribute from the list of polled attributes.

Parameters

attr_name (`str`) attribute name

Return None

stop_poll_command(*self*, *cmd_name*) → None

Remove a command from the list of polled commands.

Parameters

cmd_name (`str`) command name

Return None

subscribe_event (*self, attr_name, event, callback, filters=[], stateless=False, extract_as=Numpy*) → int

The client call to subscribe for event reception in the push model. The client implements a callback method which is triggered when the event is received. Filtering is done based on the reason specified and the event type. For example when reading the state and the reason specified is "change" the event will be fired only when the state changes. Events consist of an attribute name and the event reason. A standard set of reasons are implemented by the system, additional device specific reasons can be implemented by device servers programmers.

Parameters

attr_name (`str`) The device attribute name which will be sent as an event e.g. "current".

event_type (`EventType`) Is the event reason and must be on the enumerated values: * EventType.CHANGE_EVENT * EventType.PERIODIC_EVENT * EventType.ARCHIVE_EVENT * EventType.ATTR_CONF_EVENT * EventType.DATA_READY_EVENT * EventType.USER_EVENT

callback (`callable`) Is any callable object or an object with a callable "push_event" method.

filters (sequence<`str`>) A variable list of name,value pairs which define additional filters for events.

stateless (`bool`) When the this flag is set to false, an exception will be thrown when the event subscription encounters a problem. With the stateless flag set to true, the event subscription will always succeed, even if the corresponding device server is not running. The keep alive thread will try every 10 seconds to subscribe for the specified event. At every subscription retry, a callback is executed which contains the corresponding exception

extract_as (`ExtractAs`)

Return An event id which has to be specified when unsubscribing from this event.

Throws `EventSystemFailed`

subscribe_event(self, attr_name, event, queuesize, filters=[], stateless=False) -> int

The client call to subscribe for event reception in the pull model. Instead of a `callback` method the client has to specify the size of the event reception buffer. The event reception buffer is implemented as a round robin buffer. This way the client can set-up different ways to receive events:

- Event reception buffer size = 1 : The client is interested only in the value of the last event received. All other events that have been received since the last reading are discarded.
- Event reception buffer size > 1 : The client has chosen to keep an event history of a given size. When more events arrive since the last reading, older events will be discarded.
- Event reception buffer size = ALL_EVENTS : The client buffers all received events. The buffer size is unlimited and only restricted by the available memory for the client.

All other parameters are similar to the descriptions given in the other subscribe_event() version.

unlock(*self*, *(bool)force*) → None

Unlock a device. If used, the method argument provides a back door on the locking system. If this argument is set to true, the device will be unlocked even if the caller is not the locker. This feature is provided for administration purpopse and should be used very carefully. If this feature is used, the locker will receive a DeviceUnlocked during the next call which is normally protected by the locking Tango system.

Parameters

force (`bool`) force unlocking even if we are not the locker (optional, default value is False)

Return None

New in PyTango 7.0.0

unsubscribe_event(*self*, *event_id*) → None

Unsubscribes a client from receiving the event specified by event_id.

Parameters

event_id (`int`) is the event identifier returned by the DeviceProxy::subscribe_event(). Unlike in TangoC++ we chech that the event_id has been subscribed in this DeviceProxy.

Return None

Throws `EventSystemFailed`

write_attribute(*self*, *attr_name*, *value*, *green_mode=None*, *wait=True*, *timeout=None*) → None

write_attribute *(self, attr_info, value, green_mode=None, wait=True, timeout=None)* **->** `None`

Write a single attribute.

Parameters

attr_name (`str`) The name of the attribute to write.

attr_info (`AttributeInfo`)

value The value. For non SCALAR attributes it may be any sequence of sequences.

green_mode (`GreenMode`) Defaults to the current DeviceProxy GreenMode. (see `get_green_mode()` and `set_green_mode()`).

wait (`bool`) whether or not to wait for result. If green_mode is *Synchronous*, this parameter is ignored as it always waits for the result. Ignored when green_mode is Synchronous (always waits).

timeout (`float`) The number of seconds to wait for the result. If None, then there is no limit on the wait time. Ignored when green_mode is Synchronous or wait is False.

Throws `ConnectionFailed`, `CommunicationFailed`, `DeviceUnlocked`, `DevFailed` from device TimeoutError (green_mode == Futures) If the future didn't finish executing before the given timeout. Timeout (green_mode == Gevent) If the async result didn't finish executing before the given timeout.

New in version 8.1.0: *green_mode* parameter. *wait* parameter. *timeout* parameter.

write_attribute_asynch (*attr_name*, *value*, *cb=None*)
write_attributes_asynch(self, values) -> int write_attributes_asynch(self, values, callback) -> None

Shortcut to self.write_attributes_asynch([attr_name, value], cb)

New in PyTango 7.0.0

write_attribute_reply (*self*, *id*) → None

Check if the answer of an asynchronous write_attribute is arrived (polling model). If the reply is arrived and if it is a valid reply, the call returned. If the reply is an exception, it is re-thrown by this call. An exception is also thrown in case of the reply is not yet arrived.

Parameters

id (`int`) the asynchronous call identifier.

Return None

Throws `AsynCall`, `AsynReplyNotArrived`, `CommunicationFailed`, `DevFailed` from device.

New in PyTango 7.0.0

write_attribute_reply *(self, id, timeout)* **->** `None`

Check if the answer of an asynchronous write_attribute is arrived (polling model). id is the asynchronous call identifier. If the reply is arrived and if it is a valid reply, the call returned. If the reply is an exception, it is re-thrown by this call. If the reply is not yet arrived, the call will wait (blocking the process) for the time specified in timeout. If after timeout milliseconds, the reply is still not there, an exception is thrown. If timeout is set to 0, the call waits until the reply arrived.

Parameters

id (`int`) the asynchronous call identifier.

timeout (`int`) the timeout

Return None

Throws `AsynCall`, `AsynReplyNotArrived`, `CommunicationFailed`, `DevFailed` from device.

New in PyTango 7.0.0

write_attributes (*self*, *name_val*, *green_mode=None*, *wait=True*, *timeout=None*) → None

Write the specified attributes.

Parameters

name_val A list of pairs (attr_name, value). See write_attribute

green_mode (`GreenMode`) Defaults to the current DeviceProxy GreenMode. (see `get_green_mode()` and `set_green_mode()`).

wait (`bool`) whether or not to wait for result. If green_mode is *Synchronous*, this parameter is ignored as it always waits for the result. Ignored when green_mode is Synchronous (always waits).

timeout (`float`) The number of seconds to wait for the result. If None, then there is no limit on the wait time. Ignored when green_mode is Synchronous or wait is False.

Throws `ConnectionFailed`, `CommunicationFailed`, `DeviceUnlocked`, `DevFailed` or `NamedDevFailedList` from device TimeoutError (green_mode == Futures) If the future didn't finish executing before the given timeout. Timeout (green_mode == Gevent) If the async result didn't finish executing before the given timeout.

New in version 8.1.0: *green_mode* parameter. *wait* parameter. *timeout* parameter.

`write_attributes_asynch`(*self, values*) → int

Write asynchronously (polling model) the specified attributes.

Parameters

values (`any`) See write_attributes.

Return An asynchronous call identifier which is needed to get the server reply

Throws `ConnectionFailed`

New in PyTango 7.0.0

write_attributes_asynch *(self, values, callback)* **->** `None`

Write asynchronously (callback model) a single attribute.

Parameters

values (`any`) See write_attributes.

callback (`callable`) This callback object should be an instance of a user class with an attr_written() method . It can also be any callable object.

Return None

Throws `ConnectionFailed`

New in PyTango 7.0.0

`write_attributes_reply`(*self, id*) → None

Check if the answer of an asynchronous write_attributes is arrived (polling model). If the reply is arrived and if it is a valid reply, the call returned. If the reply is an exception, it is re-thrown by this call. An exception is also thrown in case of the reply is not yet arrived.

Parameters

id (`int`) the asynchronous call identifier.

Return None

Throws `AsynCall`, `AsynReplyNotArrived`, `CommunicationFailed`, `DevFailed` from device.

New in PyTango 7.0.0

write_attributes_reply *(self, id, timeout)* **->** `None`

Check if the answer of an asynchronous write_attributes is arrived (polling model). id is the asynchronous call identifier. If the reply is arrived and if it is a valid reply, the call returned. If the reply is an exception, it is re-thrown by this call. If the reply is not yet arrived, the call will wait (blocking the process) for the time specified in timeout. If after timeout milliseconds, the reply is still not there, an exception is thrown. If timeout is set to 0, the call waits until the reply arrived.

Parameters

id (`int`) the asynchronous call identifier.

timeout (`int`) the timeout

Return None

Throws `AsynCall`, `AsynReplyNotArrived`, `CommunicationFailed`, `DevFailed` from device.

New in PyTango 7.0.0

`write_read_attribute`(*self, attr_name, value, extract_as=ExtractAs.Numpy, green_mode=None, wait=True, timeout=None*) → DeviceAttribute

Write then read a single attribute in a single network call. By default (serialisation by device), the execution of this call in the server can't be interrupted by other clients.

Parameters see write_attribute(attr_name, value)

Return A PyTango.DeviceAttribute object.

Throws `ConnectionFailed`, `CommunicationFailed`, `DeviceUnlocked`, `DevFailed` from device, `WrongData` TimeoutError (green_mode == Futures) If the future didn't finish executing before the given timeout. Timeout (green_mode == Gevent) If the async result didn't finish executing before the given timeout.

New in PyTango 7.0.0

New in version 8.1.0: *green_mode* parameter. *wait* parameter. *timeout* parameter.

5.2.2 AttributeProxy

class `PyTango.`**`AttributeProxy`**(**args, **kwds*)

AttributeProxy is the high level Tango object which provides the client with an easy-to-use interface to TANGO attributes.

To create an AttributeProxy, a complete attribute name must be set in the object constructor.

Example: att = AttributeProxy("tango/tangotest/1/long_scalar")

Note: PyTango implementation of AttributeProxy is in part a python reimplementation of the AttributeProxy found on the C++ API.

`delete_property`(*self, value*) → None

Delete a the given of properties for this attribute. This method accepts the following types as value parameter:

1.string [in] - single property to be deleted

2.PyTango.DbDatum [in] - single property data to be deleted

3.PyTango.DbData [in] - several property data to be deleted

4.sequence<string> [in]- several property data to be deleted

5.sequence<DbDatum> [in] - several property data to be deleted

6.dict<str, obj> [in] - keys are property names to be deleted (values are ignored)

7.dict<str, DbDatum> [in] - several DbDatum.name are property names to be deleted (keys are ignored)

Parameters

value can be one of the following:

1. string [in] - single property data to be deleted
2. PyTango.DbDatum [in] - single property data to be deleted
3. PyTango.DbData [in] - several property data to be deleted
4. sequence<string> [in]- several property data to be deleted
5. sequence<DbDatum> [in] - several property data to be deleted
6. dict<str, obj> [in] - keys are property names to be deleted (values are ignored)
7. dict<str, DbDatum> [in] - several DbDatum.name are property names to be deleted (keys are ignored)

Return None

Throws `ConnectionFailed`, `CommunicationFailed` `DevFailed` from device (DB_SQLError)

`event_queue_size`(**args, **kwds*)

This method is a simple way to do: self.get_device_proxy().event_queue_size(...)

For convenience, here is the documentation of DeviceProxy.event_queue_size(...):

event_queue_size(self, event_id) -> int

Returns the number of stored events in the event reception buffer. After every call to DeviceProxy.get_events(), the event queue size is 0. During event subscription the client must have chosen the 'pull model' for this event. event_id is the event identifier returned by the DeviceProxy.subscribe_event() method.

Parameters

event_id (`int`) event identifier

Return an integer with the queue size

Throws `EventSystemFailed`

New in PyTango 7.0.0

`get_config`(**args, **kwds*)

This method is a simple way to do: self.get_device_proxy().get_attribute_config(self.name(), ...)

For convenience, here is the documentation of DeviceProxy.get_attribute_config(...):

get_attribute_config(self, name) -> AttributeInfoEx

Return the attribute configuration for a single attribute.

Parameters

name (`str`) attribute name

Return (`AttributeInfoEx`) Object containing the attribute information

Throws `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device

Deprecated: use get_attribute_config_ex instead

get_attribute_config(self, names) -> `AttributeInfoList`

Return the attribute configuration for the list of specified attributes. To get all the attributes pass a sequence containing the constant PyTango.:class:*constants*.AllAttr

Parameters

names (sequence<`str`>) attribute names

Return (`AttributeInfoList`) Object containing the attributes information

Throws `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device

Deprecated: use get_attribute_config_ex instead

`get_device_proxy`(*self*) → DeviceProxy

A method which returns the device associated to the attribute

Parameters None

Return (`DeviceProxy`)

`get_events`(**args*, ***kwds*)

This method is a simple way to do: self.get_device_proxy().get_events(...)

For convenience, here is the documentation of DeviceProxy.get_events(...):

get_events(event_id, callback=None, extract_as=Numpy) -> None

The method extracts all waiting events from the event reception buffer.

If callback is not None, it is executed for every event. During event subscription the client must have chosen the pull model for this event. The callback will receive a parameter of type EventData, AttrConfEventData or DataReadyEventData depending on the type of the event (event_type parameter of subscribe_event).

If callback is None, the method extracts all waiting events from the event reception buffer. The returned event_list is a vector of EventData, AttrConfEventData or DataReadyEventData pointers, just the same data the callback would have received.

Parameters

event_id (`int`) is the event identifier returned by the DeviceProxy.subscribe_event() method.

callback (`callable`) Any callable object or any object with a "push_event" method.

extract_as (`ExtractAs`)

Return None

Throws `EventSystemFailed`

See Also subscribe_event

New in PyTango 7.0.0

`get_last_event_date`(**args*, ***kwds*)

This method is a simple way to do: self.get_device_proxy().get_last_event_date(...)

For convenience, here is the documentation of DeviceProxy.get_last_event_date(...):

get_last_event_date(self, event_id) -> TimeVal

Returns the arrival time of the last event stored in the event reception buffer. After every call to DeviceProxy:get_events(), the event reception buffer is empty. In this case an exception will be returned. During event subscription the client must have chosen the 'pull model' for this event. event_id is the event identifier returned by the DeviceProxy.subscribe_event() method.

Parameters

event_id (`int`) event identifier

Return (`PyTango.TimeVal`) representing the arrival time

Throws `EventSystemFailed`

New in PyTango 7.0.0

`get_poll_period`(**args*, ***kwds*)

This method is a simple way to do: self.get_device_proxy().get_attribute_poll_period(self.name(), ...)

For convenience, here is the documentation of DeviceProxy.get_attribute_poll_period(...):

get_attribute_poll_period(self, attr_name) -> int

Return the attribute polling period.

Parameters

attr_name (`str`) attribute name

Return polling period in milliseconds

`get_property`(*self*, *propname*, *value*) → DbData

Get a (list) property(ies) for an attribute.

This method accepts the following types as propname parameter: 1. string [in] - single property data to be fetched 2. sequence<string> [in] - several property data to be fetched 3. PyTango.DbDatum [in] - single property data to be fetched 4. PyTango.DbData [in,out] - several property data to be fetched. 5. sequence<DbDatum> - several property data to be feteched

Note: for cases 3, 4 and 5 the 'value' parameter if given, is IGNORED.

If value is given it must be a PyTango.DbData that will be filled with the property values

Parameters

propname (`str`) property(ies) name(s)

value (`PyTango.DbData`) (optional, default is None meaning that the method will create internally a PyTango.DbData and return it filled with the property values

Return (`DbData`) containing the property(ies) value(s). If a PyTango.DbData is given as parameter, it returns the same object otherwise a new PyTango.DbData is returned

Throws `NonDbDevice`, `ConnectionFailed` (with database), `CommunicationFailed` (with database), `DevFailed` from database device

`get_transparency_reconnection`(**args*, ***kwds*)

This method is a simple way to do: self.get_device_proxy().get_transparency_reconnection(...)

For convenience, here is the documentation of DeviceProxy.get_transparency_reconnection(...):

get_transparency_reconnection(self) -> bool

Returns the device transparency reconnection flag.

Parameters None

Return (`bool`) True if transparency reconnection is set or False otherwise

`history`(**args*, ***kwds*)

This method is a simple way to do: self.get_device_proxy().attribute_history(self.name(), ...)

For convenience, here is the documentation of DeviceProxy.attribute_history(...):

attribute_history(self, attr_name, depth, extract_as=ExtractAs.Numpy) -> sequence<DeviceAttributeHistory>

Retrieve attribute history from the attribute polling buffer. See chapter on Advanced Feature for all details regarding polling

Parameters

attr_name (`str`) Attribute name.

depth (`int`) The wanted history depth.

extract_as (`ExtractAs`)

Return This method returns a vector of DeviceAttributeHistory types.

Throws `NonSupportedFeature`, `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device

`is_event_queue_empty`(**args*, ***kwds*)

This method is a simple way to do: self.get_device_proxy().is_event_queue_empty(...)

For convenience, here is the documentation of DeviceProxy.is_event_queue_empty(...):

is_event_queue_empty(self, event_id) -> bool

Returns true when the event reception buffer is empty. During event subscription the client must have chosen the 'pull model' for this event. event_id is the event identifier returned by the DeviceProxy.subscribe_event() method.

Parameters

event_id (`int`) event identifier

Return (`bool`) True if queue is empty or False otherwise

Throws `EventSystemFailed`

New in PyTango 7.0.0

`is_polled`(**args*, ***kwds*)

This method is a simple way to do: self.get_device_proxy().is_attribute_polled(self.name(), ...)

For convenience, here is the documentation of DeviceProxy.is_attribute_polled(...):

is_attribute_polled(self, attr_name) -> bool

True if the attribute is polled.

Parameters

attr_name (`str`) attribute name

Return boolean value

`name`(*self*) → str

Returns the attribute name

Parameters None

Return (`str`) with the attribute name

`ping`(**args*, ***kwds*)

This method is a simple way to do: self.get_device_proxy().ping(...)

For convenience, here is the documentation of DeviceProxy.ping(...):

ping(self) -> int

A method which sends a ping to the device

Parameters None

Return (`int`) time elapsed in microseconds

Throws `exception` if device is not alive

`poll`(**args*, ***kwds*)

This method is a simple way to do: self.get_device_proxy().poll_attribute(self.name(), ...)

For convenience, here is the documentation of DeviceProxy.poll_attribute(...):

poll_attribute(self, attr_name, period) -> None

Add an attribute to the list of polled attributes.

Parameters

attr_name (`str`) attribute name

period (`int`) polling period in milliseconds

Return None

`put_property`(*self*, *value*) → None

Insert or update a list of properties for this attribute. This method accepts the following types as value parameter: 1. PyTango.DbDatum - single property data to be inserted 2. PyTango.DbData - several property data to be inserted 3. sequence<DbDatum> - several property data to be inserted 4. dict<str, DbDatum> - keys are property names and value has data to be inserted 5. dict<str, seq<str>> - keys are property names and value has data to be inserted 6. dict<str, obj> - keys are property names and str(obj) is property value

Parameters

value can be one of the following: 1. PyTango.DbDatum - single property data to be inserted 2. PyTango.DbData - several property data to be inserted 3. sequence<DbDatum> - several property data to be inserted 4. dict<str, DbDatum> - keys are property names and value has data to be inserted 5. dict<str, seq<str>> - keys are property names and value has data to be inserted 6. dict<str, obj> - keys are property names and str(obj) is property value

Return None

Throws `ConnectionFailed`, `CommunicationFailed` `DevFailed` from device (DB_SQLError)

`read`(**args*, ***kwds*)

This method is a simple way to do: self.get_device_proxy().read_attribute(self.name(), ...)

For convenience, here is the documentation of DeviceProxy.read_attribute(...):

read_attribute(self, attr_name, extract_as=ExtractAs.Numpy, green_mode=None, wait=True, timeout=None) -> DeviceAttribute

Read a single attribute.

Parameters

attr_name (`str`) The name of the attribute to read.

extract_as (`ExtractAs`) Defaults to numpy.

green_mode (`GreenMode`) Defaults to the current DeviceProxy GreenMode. (see `get_green_mode()` and `set_green_mode()`).

wait (`bool`) whether or not to wait for result. If green_mode is *Synchronous*, this parameter is ignored as it always waits for the result. Ignored when green_mode is Synchronous (always waits).

timeout (`float`) The number of seconds to wait for the result. If None, then there is no limit on the wait time. Ignored when green_mode is Synchronous or wait is False.

Return (`DeviceAttribute`)

Throws `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device TimeoutError (green_mode == Futures) If the future didn't finish executing before the given timeout. Timeout (green_mode == Gevent) If the async result didn't finish executing before the given timeout.

Changed in version 7.1.4: For `DevEncoded` attributes, before it was returning a `DeviceAttribute`.value as a tuple **(format<str>, data<str>)** no matter what was the *extract_as* value was. Since 7.1.4, it returns a **(format<str>, data<buffer>)** unless *extract_as* is String, in which case it returns **(format<str>, data<str>)**.

Changed in version 8.0.0: For `DevEncoded` attributes, now returns a `DeviceAttribute`.value as a tuple **(format<str>, data<bytes>)** unless *extract_as* is String, in which case it returns **(format<str>, data<str>)**. Carefull, if using python >= 3 data<str> is decoded using default python *utf-8* encoding. This means that PyTango assumes tango DS was written encapsulating string into *utf-8* which is the default python encoding.

New in version 8.1.0: *green_mode* parameter. *wait* parameter. *timeout* parameter.

`read_asynch`(**args*, ***kwds*)

This method is a simple way to do: self.get_device_proxy().read_attribute_asynch(self.name(), ...)

For convenience, here is the documentation of DeviceProxy.read_attribute_asynch(...):

read_attribute_asynch(self, attr_name) -> int read_attribute_asynch(self, attr_name, callback) -> None

Shortcut to self.read_attributes_asynch([attr_name], cb)

New in PyTango 7.0.0

`read_reply`(**args*, ***kwds*)

This method is a simple way to do: self.get_device_proxy().read_attribute_reply(...)

For convenience, here is the documentation of DeviceProxy.read_attribute_reply(...):

read_attribute_reply(self, id, extract_as) -> int read_attribute_reply(self, id, timeout, extract_as) -> None

Shortcut to self.read_attributes_reply()[0]

New in PyTango 7.0.0

`set_config`(**args*, ***kwds*)

This method is a simple way to do: self.get_device_proxy().set_attribute_config(...)

For convenience, here is the documentation of DeviceProxy.set_attribute_config(...):

set_attribute_config(self, attr_info) -> None

Change the attribute configuration for the specified attribute

Parameters

attr_info (`AttributeInfo`) attribute information

Return None

Throws `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device

set_attribute_config(self, attr_info_ex) -> None

Change the extended attribute configuration for the specified attribute

Parameters

attr_info_ex (`AttributeInfoEx`) extended attribute information

Return None

Throws `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device

set_attribute_config(self, attr_info) -> None

Change the attributes configuration for the specified attributes

Parameters

attr_info (sequence<`AttributeInfo`>) attributes information

Return None

Throws `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device

set_attribute_config(self, attr_info_ex) -> None

Change the extended attributes configuration for the specified attributes

Parameters

attr_info_ex (sequence<`AttributeInfoListEx`>) extended attributes information

Return None

Throws `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device

`set_transparency_reconnection`(**args*, ***kwds*)

This method is a simple way to do: self.get_device_proxy().set_transparency_reconnection(...)

For convenience, here is the documentation of DeviceProxy.set_transparency_reconnection(...):

set_transparency_reconnection(self, yesno) -> None

Set the device transparency reconnection flag

Parameters '' - val : (bool) True to set transparency reconnection '' or False otherwise

Return None

`state`(**args*, ***kwds*)

This method is a simple way to do: self.get_device_proxy().state(...)

For convenience, here is the documentation of DeviceProxy.state(...): **state** *(self)* **->** `DevState`

A method which returns the state of the device.

Parameters None

Return (`DevState`) constant

Example

```
dev_st = dev.state()
if dev_st == DevState.ON : ...
```

status (**args, **kwds*)

This method is a simple way to do: self.get_device_proxy().status(...)

For convenience, here is the documentation of DeviceProxy.status(...): **status** *(self)* **->** `str`

A method which returns the status of the device as a string.

Parameters None

Return (`str`) describing the device status

stop_poll (**args, **kwds*)

This method is a simple way to do: self.get_device_proxy().stop_poll_attribute(self.name(), ...)

For convenience, here is the documentation of DeviceProxy.stop_poll_attribute(...):

stop_poll_attribute(self, attr_name) -> None

Remove an attribute from the list of polled attributes.

Parameters

attr_name (`str`) attribute name

Return None

subscribe_event (**args, **kwds*)

This method is a simple way to do: self.get_device_proxy().subscribe_event(self.name(), ...)

For convenience, here is the documentation of DeviceProxy.subscribe_event(...):

subscribe_event(self, attr_name, event, callback, filters=[], stateless=False, extract_as=Numpy) -> int

The client call to subscribe for event reception in the push model. The client implements a callback method which is triggered when the event is received. Filtering is done based on the reason specified and the event type. For example when reading the state and the reason specified is “change” the event will be fired only when the state changes. Events consist of an attribute name and the event reason. A standard set of reasons are implemented by the system, additional device specific reasons can be implemented by device servers programmers.

Parameters

attr_name (`str`) The device attribute name which will be sent as an event e.g. “current”.

event_type (`EventType`) Is the event reason and must be on the enumerated values: * EventType.CHANGE_EVENT * EventType.PERIODIC_EVENT * EventType.ARCHIVE_EVENT * EventType.ATTR_CONF_EVENT * EventType.DATA_READY_EVENT * EventType.USER_EVENT

callback (`callable`) Is any callable object or an object with a callable “push_event” method.

filters (sequence<`str`>) A variable list of name,value pairs which define additional filters for events.

stateless (`bool`) When the this flag is set to false, an exception will be thrown when the event subscription encounters a problem. With the stateless flag set to true, the event subscription will always succeed, even if the corresponding device server is not running. The keep alive thread will try every 10 seconds to subscribe for the specified event. At every subscription retry, a callback is executed which contains the corresponding exception

extract_as (`ExtractAs`)

Return An event id which has to be specified when unsubscribing from this event.

Throws `EventSystemFailed`

subscribe_event(self, attr_name, event, queuesize, filters=[], stateless=False) -> int

The client call to subscribe for event reception in the pull model. Instead of a `callback` method the client has to specify the size of the event reception buffer. The event reception buffer is implemented as a round robin buffer. This way the client can set-up different ways to receive events:

- Event reception buffer size = 1 : The client is interested only in the value of the last event received. All other events that have been received since the last reading are discarded.
- Event reception buffer size > 1 : The client has chosen to keep an event history of a given size. When more events arrive since the last reading, older events will be discarded.
- Event reception buffer size = ALL_EVENTS : The client buffers all received events. The buffer size is unlimited and only restricted by the available memory for the client.

All other parameters are similar to the descriptions given in the other subscribe_event() version.

`unsubscribe_event` (**args*, ***kwds*)

This method is a simple way to do: self.get_device_proxy().unsubscribe_event(...)

For convenience, here is the documentation of DeviceProxy.unsubscribe_event(...):

unsubscribe_event(self, event_id) -> None

Unsubscribes a client from receiving the event specified by event_id.

Parameters

event_id (`int`) is the event identifier returned by the DeviceProxy::subscribe_event(). Unlike in TangoC++ we chech that the event_id has been subscribed in this DeviceProxy.

Return None

Throws `EventSystemFailed`

write(**args*, ***kwds*)

This method is a simple way to do: self.get_device_proxy().write_attribute(self.name(), ...)

For convenience, here is the documentation of DeviceProxy.write_attribute(...):

write_attribute(self, attr_name, value, green_mode=None, wait=True, timeout=None) -> None write_attribute(self, attr_info, value, green_mode=None, wait=True, timeout=None) -> None

Write a single attribute.

Parameters

attr_name (`str`) The name of the attribute to write.

attr_info (`AttributeInfo`)

value The value. For non SCALAR attributes it may be any sequence of sequences.

green_mode (`GreenMode`) Defaults to the current DeviceProxy GreenMode. (see `get_green_mode()` and `set_green_mode()`).

wait (`bool`) whether or not to wait for result. If green_mode is *Synchronous*, this parameter is ignored as it always waits for the result. Ignored when green_mode is Synchronous (always waits).

timeout (`float`) The number of seconds to wait for the result. If None, then there is no limit on the wait time. Ignored when green_mode is Synchronous or wait is False.

Throws `ConnectionFailed`, `CommunicationFailed`, `DeviceUnlocked`, `DevFailed` from device TimeoutError (green_mode == Futures) If the future didn't finish executing before the given timeout. Timeout (green_mode == Gevent) If the async result didn't finish executing before the given timeout.

New in version 8.1.0: *green_mode* parameter. *wait* parameter. *timeout* parameter.

write_asynch(**args*, ***kwds*)

This method is a simple way to do: self.get_device_proxy().write_attribute_asynch(...)

For convenience, here is the documentation of DeviceProxy.write_attribute_asynch(...):

write_attributes_asynch(self, values) -> int write_attributes_asynch(self, values, callback) -> None

Shortcut to self.write_attributes_asynch([attr_name, value], cb)

New in PyTango 7.0.0

write_read(**args*, ***kwds*)

This method is a simple way to do: self.get_device_proxy().write_read_attribute(self.name(), ...)

For convenience, here is the documentation of DeviceProxy.write_read_attribute(...):

write_read_attribute(self, attr_name, value, extract_as=ExtractAs.Numpy, green_mode=None, wait=True, timeout=None) -> DeviceAttribute

Write then read a single attribute in a single network call. By default (serialisation by device), the execution of this call in the server can't be interrupted by other clients.

Parameters see write_attribute(attr_name, value)

Return A PyTango.DeviceAttribute object.

Throws `ConnectionFailed`, `CommunicationFailed`, `DeviceUnlocked`, `DevFailed` from device, `WrongData` TimeoutError (green_mode == Futures) If the future didn't finish executing before the given timeout. Timeout (green_mode == Gevent) If the async result didn't finish executing before the given timeout.

New in PyTango 7.0.0

New in version 8.1.0: *green_mode* parameter. *wait* parameter. *timeout* parameter.

`write_reply`(**args*, ***kwds*)

This method is a simple way to do: self.get_device_proxy().write_attribute_reply(...)

For convenience, here is the documentation of DeviceProxy.write_attribute_reply(...):

write_attribute_reply(self, id) -> None

Check if the answer of an asynchronous write_attribute is arrived (polling model). If the reply is arrived and if it is a valid reply, the call returned. If the reply is an exception, it is re-thrown by this call. An exception is also thrown in case of the reply is not yet arrived.

Parameters

id (`int`) the asynchronous call identifier.

Return None

Throws `AsynCall`, `AsynReplyNotArrived`, `CommunicationFailed`, `DevFailed` from device.

New in PyTango 7.0.0

write_attribute_reply(self, id, timeout) -> None

Check if the answer of an asynchronous write_attribute is arrived (polling model). id is the asynchronous call identifier. If the reply is arrived and if it is a valid reply, the call returned. If the reply is an exception, it is re-thrown by this call. If the reply is not yet arrived, the call will wait (blocking the process) for the time specified in timeout. If after timeout milliseconds, the reply is still not there, an exception is thrown. If timeout is set to 0, the call waits until the reply arrived.

Parameters

id (`int`) the asynchronous call identifier.

timeout (`int`) the timeout

Return None

Throws `AsynCall`, `AsynReplyNotArrived`, `CommunicationFailed`, `DevFailed` from device.

New in PyTango 7.0.0

5.2.3 Group

Group class

class `PyTango.`**`Group`**(*name*)

A Tango Group represents a hierarchy of tango devices. The hierarchy may have more than one level. The main goal is to group devices with same attribute(s)/command(s) to be able to do parallel requests.

`add`(*self*, *subgroup*, *timeout_ms=-1*) → None

Attaches a (sub)_RealGroup.

To remove the subgroup use the remove() method.

Parameters

subgroup (`str`)

timeout_ms (`int`) If timeout_ms parameter is different from -1, the client side timeout associated to each device composing the _RealGroup added is set to timeout_ms milliseconds. If timeout_ms is -1, timeouts are not changed.

Return None

Throws TypeError, ArgumentError

add(self, patterns, timeout_ms=-1) -> None

Attaches any device which name matches one of the specified patterns.

This method first asks to the Tango database the list of device names matching one the patterns. Devices are then attached to the `group` in the order in which they are returned by the database.

Any device already present in the hierarchy (i.e. a device belonging to the `group` or to one of its subgroups), is silently ignored but its client side timeout is set to timeout_ms milliseconds if timeout_ms is different from -1.

Parameters

patterns (str | sequence<str>) can be a simple device name or a device name pattern (e.g. domain_*/ family/member_*), or a sequence of these.

timeout_ms (`int`) If timeout_ms is different from -1, the client side timeouts of all devices matching the specified patterns are set to timeout_ms milliseconds.

Return None

Throws TypeError, ArgumentError

`command_inout`(*self*, *cmd_name*, *forward=True*) → sequence<GroupCmdReply>

command_inout *(self, cmd_name, param, forward=True)* **->** sequence<`GroupCmdReply`>

command_inout *(self, cmd_name, param_list, forward=True)* **->** sequence<`GroupCmdReply`>

Just a shortcut to do: self.command_inout_reply(self.command_inout_asynch(...))

Parameters

cmd_name (`str`) Command name

param (`any`) parameter value

param_list (`PyTango.DeviceDataList`) sequence of parameters. When given, it's length must match the group size.

forward (`bool`) If it is set to true (the default) request is forwarded to subgroups. Otherwise, it is only applied to the local set of devices.

Return (sequence<`GroupCmdReply`>)

`command_inout_asynch`(*self, cmd_name, forget=False, forward=True, reserved=-1*) → int

command_inout_asynch *(self, cmd_name, param, forget=False, forward=True, reserved=-1)* **->** `int`

command_inout_asynch *(self, cmd_name, param_list, forget=False, forward=True, reserved=-1)* **->** `int`

Executes a Tango command on each device in the group asynchronously. The method sends the request to all devices and returns immediately. Pass the returned request id to Group.command_inout_reply() to obtain the results.

Parameters

cmd_name (`str`) Command name

param (`any`) parameter value

param_list (`PyTango.DeviceDataList`) sequence of parameters. When given, it's length must match the group size.

forget (`bool`) Fire and forget flag. If set to true, it means that no reply is expected (i.e. the caller does not care about it and will not even try to get it)

forward (`bool`) If it is set to true (the default) request is forwarded to subgroups. Otherwise, it is only applied to the local set of devices.

reserved (`int`) is reserved for internal purpose and should not be used. This parameter may disappear in a near future.

Return (`int`) request id. Pass the returned request id to Group.command_inout_reply() to obtain the results.

Throws

`command_inout_reply`(*self, req_id, timeout_ms=0*) → sequence<GroupCmdReply>

Returns the results of an asynchronous command.

Parameters

req_id (`int`) Is a request identifier previously returned by one of the command_inout_asynch methods

timeout_ms (`int`) For each device in the hierarchy, if the command result is not yet available, command_inout_reply wait timeout_ms milliseconds before throwing an exception. This exception will be part of the global reply. If timeout_ms is set to 0, command_inout_reply waits "indefinitely".

Return (sequence<`GroupCmdReply`>)

Throws

contains (*self, pattern, forward=True*) → bool

Parameters

pattern (str) The pattern can be a fully qualified or simple group name, a device name or a device name pattern.

forward (bool) If fwd is set to true (the default), the remove request is also forwarded to subgroups. Otherwise, it is only applied to the local set of elements.

Return (bool) Returns true if the hierarchy contains groups and/or devices which name matches the specified pattern. Returns false otherwise.

Throws

disable (**args, **kwds*)
Disables a group or a device element in a group.

enable (**args, **kwds*)
Enables a group or a device element in a group.

get_device (*self, dev_name*) → DeviceProxy
get_device *(self, idx)* **->** `DeviceProxy`

Returns a reference to the specified device or None if there is no device by that name in the group. Or, returns a reference to the "idx-th" device in the hierarchy or NULL if the hierarchy contains less than "idx" devices.

This method may throw an exception in case the specified device belongs to the group but can't be reached (not registered, down...). See example below:

```
try:
    dp = g.get_device("my/device/01")
    if dp is None:
        # my/device/01 does not belong to the group
        pass
except DevFailed, f:
    # my/device/01 belongs to the group but can't be reached
    pass
```

The request is systematically forwarded to subgroups (i.e. if no device named device_name could be found in the local set of devices, the request is forwarded to subgroups).

Parameters

dev_name (str) Device name.

idx (int) Device number.

Return (DeviceProxy) Be aware that this method returns a different DeviceProxy referring to the same device each time. So, do not use it directly for permanent things.

Example

```
# WRONG: The DeviceProxy will quickly go out of scope
# and disappear (thus, the event will be automatically
# unsubscribed)
g.get_device("my/device/01").subscribe_events('attr', callback)

# GOOD:
```

```
dp = g.get_device("my/device/01")
dp.subscribe_events('attr', callback)
```

Throws `DevFailed`

`get_device_list`(*self*, *forward=True*) → sequence<str>

Considering the following hierarchy:

```
g2.add("my/device/04")
g2.add("my/device/05")

g4.add("my/device/08")
g4.add("my/device/09")

g3.add("my/device/06")
g3.add(g4)
g3.add("my/device/07")

g1.add("my/device/01")
g1.add(g2)
g1.add("my/device/03")
g1.add(g3)
g1.add("my/device/02")
```

The returned vector content depends on the value of the forward option. If set to true, the results will be organized as follows:

```
    dl = g1.get_device_list(True)

dl[0] contains "my/device/01" which belongs to g1
dl[1] contains "my/device/04" which belongs to g1.g2
dl[2] contains "my/device/05" which belongs to g1.g2
dl[3] contains "my/device/03" which belongs to g1
dl[4] contains "my/device/06" which belongs to g1.g3
dl[5] contains "my/device/08" which belongs to g1.g3.g4
dl[6] contains "my/device/09" which belongs to g1.g3.g4
dl[7] contains "my/device/07" which belongs to g1.g3
dl[8] contains "my/device/02" which belongs to g1
```

If the forward option is set to false, the results are:

```
    dl = g1.get_device_list(False);

dl[0] contains "my/device/01" which belongs to g1
dl[1] contains "my/device/03" which belongs to g1
dl[2] contains "my/device/02" which belongs to g1
```

Parameters

forward (`bool`) If it is set to true (the default), the request is forwarded to sub-groups. Otherwise, it is only applied to the local set of devices.

Return (sequence<`str`>) The list of devices currently in the hierarchy.

Throws

`get_fully_qualified_name`(**args*, ***kwds*)

Get the complete (dpt-separated) name of the group. This takes into consideration the name of the group and its parents.

get_name (**args, **kwds*)
Get the name of the group. Eg: Group('name').get_name() == 'name'

get_size (*self, forward=True*) → int

Parameters

forward (bool) If it is set to true (the default), the request is forwarded to sub-groups.

Return (int) The number of the devices in the hierarchy

Throws

is_enabled (**args, **kwds*)
Check if a group is enabled. *New in PyTango 7.0.0*

name_equals (**args, **kwds*)
New in PyTango 7.0.0

name_matches (**args, **kwds*)
New in PyTango 7.0.0

ping (*self, forward=True*) → bool

Ping all devices in a group.

Parameters

forward (bool) If fwd is set to true (the default), the request is also forwarded to subgroups. Otherwise, it is only applied to the local set of devices.

Return (bool) This method returns true if all devices in the group are alive, false otherwise.

Throws

read_attribute (*self, attr_name, forward=True*) → sequence<GroupAttrReply>

Just a shortcut to do: self.read_attribute_reply(self.read_attribute_asynch(...))

read_attribute_asynch (*self, attr_name, forward=True, reserved=-1*) → int

Reads an attribute on each device in the group asynchronously. The method sends the request to all devices and returns immediately.

Parameters

attr_name (str) Name of the attribute to read.

forward (bool) If it is set to true (the default) request is forwarded to subgroups. Otherwise, it is only applied to the local set of devices.

reserved (int) is reserved for internal purpose and should not be used. This parameter may disappear in a near future.

Return (int) request id. Pass the returned request id to Group.read_attribute_reply() to obtain the results.

Throws

read_attribute_reply (*self, req_id, timeout_ms=0*) → sequence<GroupAttrReply>

Returns the results of an asynchronous attribute reading.

Parameters

req_id (`int`) a request identifier previously returned by read_attribute_asynch.

timeout_ms (`int`) For each device in the hierarchy, if the attribute value is not yet available, read_attribute_reply wait timeout_ms milliseconds before throwing an exception. This exception will be part of the global reply. If timeout_ms is set to 0, read_attribute_reply waits "indefinitely".

Return (sequence<`GroupAttrReply`>)

Throws

`read_attributes`(*self*, *attr_names*, *forward=True*) → sequence<GroupAttrReply>

Just a shortcut to do: self.read_attributes_reply(self.read_attributes_asynch(...))

`read_attributes_asynch`(*self*, *attr_names*, *forward=True*, *reserved=-1*) → int

Reads the attributes on each device in the group asynchronously. The method sends the request to all devices and returns immediately.

Parameters

attr_names (sequence<`str`>) Name of the attributes to read.

forward (`bool`) If it is set to true (the default) request is forwarded to subgroups. Otherwise, it is only applied to the local set of devices.

reserved (`int`) is reserved for internal purpose and should not be used. This parameter may disappear in a near future.

Return (`int`) request id. Pass the returned request id to Group.read_attributes_reply() to obtain the results.

Throws

`read_attributes_reply`(*self*, *req_id*, *timeout_ms=0*) → sequence<GroupAttrReply>

Returns the results of an asynchronous attribute reading.

Parameters

req_id (`int`) a request identifier previously returned by read_attribute_asynch.

timeout_ms (`int`) For each device in the hierarchy, if the attribute value is not yet available, read_attribute_reply ait timeout_ms milliseconds before throwing an exception. This exception will be part of the global reply. If timeout_ms is set to 0, read_attributes_reply waits "indefinitely".

Return (sequence<`GroupAttrReply`>)

Throws

`remove_all`(*self*) → None

Removes all elements in the _RealGroup. After such a call, the _RealGroup is empty.

`set_timeout_millis`(*self*, *timeout_ms*) → bool

Set client side timeout for all devices composing the group in milliseconds. Any method which takes longer than this time to execute will throw an exception.

Parameters

timeout_ms (`int`)

Return None

Throws (errors are ignored)

New in PyTango 7.0.0

write_attribute(*self*, *attr_name*, *value*, *forward=True*, *multi=False*) → sequence<GroupReply>

Just a shortcut to do: self.write_attribute_reply(self.write_attribute_asynch(...))

write_attribute_asynch(*self*, *attr_name*, *value*, *forward=True*, *multi=False*) → int

Writes an attribute on each device in the group asynchronously. The method sends the request to all devices and returns immediately.

Parameters

attr_name (`str`) Name of the attribute to write.

value (`any`) Value to write. See DeviceProxy.write_attribute

forward (`bool`) If it is set to true (the default) request is forwarded to subgroups. Otherwise, it is only applied to the local set of devices.

multi (`bool`) If it is set to false (the default), the same value is applied to all devices in the group. Otherwise the value is interpreted as a sequence of values, and each value is applied to the corresponding device in the group. In this case len(value) must be equal to group.get_size()!

Return (`int`) request id. Pass the returned request id to Group.write_attribute_reply() to obtain the acknowledgements.

Throws

write_attribute_reply(*self*, *req_id*, *timeout_ms=0*) → sequence<GroupReply>

Returns the acknowledgements of an asynchronous attribute writing.

Parameters

req_id (`int`) a request identifier previously returned by write_attribute_asynch.

timeout_ms (`int`) For each device in the hierarchy, if the acknowledgment is not yet available, write_attribute_reply wait timeout_ms milliseconds before throwing an exception. This exception will be part of the global reply. If timeout_ms is set to 0, write_attribute_reply waits "indefinitely".

Return (sequence<`GroupReply`>)

Throws

GroupReply classes

Group member functions do not return the same as their DeviceProxy counterparts, but objects that contain them. This is:

- *write attribute* family returns PyTango.GroupReplyList
- *read attribute* family returns PyTango.GroupAttrReplyList
- *command inout* family returns PyTango.GroupCmdReplyList

The Group*ReplyList objects are just list-like objects containing `GroupReply`, `GroupAttrReply` and `GroupCmdReply` elements that will be described now.

Note also that GroupReply is the base of GroupCmdReply and GroupAttrReply.

class `PyTango.`**`GroupReply`**

This is the base class for the result of an operation on a PyTangoGroup, being it a write attribute, read attribute, or command inout operation.

It has some trivial common operations:

- has_failed(self) -> bool
- group_element_enabled(self) ->bool
- dev_name(self) -> str
- obj_name(self) -> str
- get_err_stack(self) -> DevErrorList

class `PyTango.`**`GroupAttrReply`**

Bases: `PyTango._PyTango.GroupReply`

`get_data`(*self*, *extract_as=ExtractAs.Numpy*) → DeviceAttribute

Get the DeviceAttribute.

Parameters

extract_as (`ExtractAs`)

Return (`DeviceAttribute`) Whatever is stored there, or None.

class `PyTango.`**`GroupCmdReply`**

Bases: `PyTango._PyTango.GroupReply`

`get_data`(*self*) → any

Get the actual value stored in the GroupCmdRply, the command output value. It's the same as self.get_data_raw().extract()

Parameters None

Return (`any`) Whatever is stored there, or None.

`get_data_raw`(*self*) → any

Get the DeviceData containing the output parameter of the command.

Parameters None

Return (`DeviceData`) Whatever is stored there, or None.

5.2.4 Green API

Summary:

- `PyTango.get_green_mode()`
- `PyTango.set_green_mode()`
- `PyTango.futures.DeviceProxy()`
- `PyTango.gevent.DeviceProxy()`

`PyTango.`**`get_green_mode`**`()`

Returns the current global default PyTango green mode.

Returns the current global default PyTango green mode

Return type GreenMode

`PyTango.`**`set_green_mode`**(*green_mode=None*)

Sets the global default PyTango green mode.

Advice: Use only in your final application. Don't use this in a python library in order not to interfere with the beavior of other libraries and/or application where your library is being.

Parameters **`green_mode`** (*GreenMode*) – the new global default PyTango green mode

`PyTango.futures.`**`DeviceProxy`**(*self*, *dev_name*, *wait=True*, *timeout=True*) → DeviceProxy

DeviceProxy(self, dev_name, need_check_acc, wait=True, timeout=True) -> DeviceProxy

Creates a *futures* enabled `DeviceProxy`.

The DeviceProxy constructor internally makes some network calls which makes it *slow*. By using the futures *green mode* you are allowing other python code to be executed in a cooperative way.

Note: The timeout parameter has no relation with the tango device client side timeout (gettable by `get_timeout_millis()` and settable through `set_timeout_millis()`)

Parameters

- **`dev_name`** (*str*) – the device name or alias
- **`need_check_acc`** (*bool*) – in first version of the function it defaults to True. Determines if at creation time of DeviceProxy it should check for channel access (rarely used)
- **`wait`** (*bool*) – whether or not to wait for result of creating a DeviceProxy.
- **`timeout`** (*float*) – The number of seconds to wait for the result. If None, then there is no limit on the wait time. Ignored when wait is False.

Returns

if wait is True: `DeviceProxy`

else: `concurrent.futures.Future`

Throws

- a *DevFailed* if wait is True and there is an error creating the device.
- a *concurrent.futures.TimeoutError* if wait is False, timeout is not None and the time to create the device has expired.

New in PyTango 8.1.0

`PyTango.gevent.`**`DeviceProxy`**(*self*, *dev_name*, *wait=True*, *timeout=True*) → DeviceProxy

DeviceProxy(self, dev_name, need_check_acc, wait=True, timeout=True) -> DeviceProxy

Creates a *gevent* enabled `DeviceProxy`.

The DeviceProxy constructor internally makes some network calls which makes it *slow*. By using the gevent *green mode* you are allowing other python code to be executed in a cooperative way.

Note: The timeout parameter has no relation with the tango device client side timeout (gettable by `get_timeout_millis()` and settable through `set_timeout_millis()`)

Parameters

- **`dev_name`** (*str*) – the device name or alias
- **`need_check_acc`** (*bool*) – in first version of the function it defaults to True. Determines if at creation time of DeviceProxy it should check for channel access (rarely used)
- **`wait`** (*bool*) – whether or not to wait for result of creating a DeviceProxy.
- **`timeout`** (*float*) – The number of seconds to wait for the result. If None, then there is no limit on the wait time. Ignored when wait is False.

Returns

if wait is True: `DeviceProxy`

else: `gevent.event.AsynchResult`

Throws

- a *DevFailed* if wait is True and there is an error creating the device.
- a *gevent.timeout.Timeout* if wait is False, timeout is not None and the time to create the device has expired.

New in PyTango 8.1.0

5.2.5 API util

class `PyTango.`**`ApiUtil`**

This class allows you to access the tango syncronization model API. It is designed as a singleton. To get a reference to the singleton object you must do:

```
import PyTango
apiutil = PyTango.ApiUtil.instance()
```

New in PyTango 7.1.3

`get_asynch_cb_sub_model`(*self*) → cb_sub_model

Get the asynchronous callback sub-model.

Parameters None

Return (`cb_sub_model`) the active asynchronous callback sub-model.

New in PyTango 7.1.3

`get_asynch_replies`(*self*) → None

Fire callback methods for all (any device) asynchronous requests (command and attribute) with already arrived replied. Returns immediately if there is no replies already arrived or if there is no asynchronous requests.

Parameters None

Return None

Throws None, all errors are reported using the err and errors fields of the parameter passed to the `callback` method.

New in PyTango 7.1.3

get_asynch_replies *(self)* **->** `None`

Fire callback methods for all (any device) asynchronous requests (command and attributes) with already arrived replied. Wait and block the caller for timeout milliseconds if they are some device asynchronous requests which are not yet arrived. Returns immediately if there is no asynchronous request. If timeout is set to 0, the call waits until all the asynchronous requests sent has received a reply.

Parameters

timeout (`int`) timeout (milliseconds)

Return None

Throws `AsynReplyNotArrived`. All other errors are reported using the err and errors fields of the object passed to the `callback` methods.

New in PyTango 7.1.3

static **`instance`**`()` → ApiUtil

Returns the ApiUtil singleton instance.

Parameters None

Return (`ApiUtil`) a reference to the ApiUtil singleton object.

New in PyTango 7.1.3

`pending_asynch_call``(`*self, req*`)` → int

Return number of asynchronous pending requests (any device). The input parameter is an enumeration with three values which are:

- POLLING: Return only polling model asynchronous request number
- CALL_BACK: Return only callback model asynchronous request number
- ALL_ASYNCH: Return all asynchronous request number

Parameters

req (`asyn_req_type`) asynchronous request type

Return (`int`) the number of pending requests for the given type

New in PyTango 7.1.3

`set_asynch_cb_sub_model``(`*self, model*`)` → None

Set the asynchronous callback sub-model between the pull and push sub-model. The cb_sub_model data type is an enumeration with two values which are:

- PUSH_CALLBACK: The push sub-model
- PULL_CALLBACK: The pull sub-model

Parameters

model (`cb_sub_model`) the callback sub-model

Return None

New in PyTango 7.1.3

5.2.6 Information classes

See also Event configuration information

Attribute

class `PyTango.`**`AttributeAlarmInfo`**

A structure containing available alarm information for an attribute with the folowing members:

- min_alarm : (`str`) low alarm level
- max_alarm : (`str`) high alarm level
- min_warning : (`str`) low warning level

- max_warning : (`str`) high warning level
- delta_t : (`str`) time delta
- delta_val : (`str`) value delta
- extensions : (`StdStringVector`) extensions (currently not used)

class `PyTango.`**`AttributeDimension`**

A structure containing x and y attribute data dimensions with the following members:

- dim_x : (`int`) x dimension
- dim_y : (`int`) y dimension

class `PyTango.`**`AttributeInfo`**

A structure (inheriting from `DeviceAttributeConfig`) containing available information for an attribute with the following members:

- disp_level : (`DispLevel`) display level (OPERATOR, EXPERT)

Inherited members are:

- name : (`str`) attribute name
- writable : (`AttrWriteType`) write type (R, W, RW, R with W)
- data_format : (`AttrDataFormat`) data format (SCALAR, SPECTRUM, IMAGE)
- data_type : (`int`) attribute type (float, string,..)
- max_dim_x : (`int`) first dimension of attribute (spectrum or image attributes)
- max_dim_y : (`int`) second dimension of attribute(image attribute)
- description : (`int`) attribute description
- label : (`str`) attribute label (Voltage, time, ...)
- unit : (`str`) attribute unit (V, ms, ...)
- standard_unit : (`str`) standard unit
- display_unit : (`str`) display unit
- format : (`str`) how to display the attribute value (ex: for floats could be '%6.2f')
- min_value : (`str`) minimum allowed value
- max_value : (`str`) maximum allowed value
- min_alarm : (`str`) low alarm level
- max_alarm : (`str`) high alarm level
- writable_attr_name : (`str`) name of the writable attribute
- extensions : (`StdStringVector`) extensions (currently not used)

class `PyTango.`**`AttributeInfoEx`**

A structure (inheriting from `AttributeInfo`) containing available information for an attribute with the following members:

- alarms : object containing alarm information (see AttributeAlarmInfo).
- events : object containing event information (see AttributeEventInfo).
- sys_extensions : StdStringVector

Inherited members are:

- name : (`str`) attribute name
- writable : (`AttrWriteType`) write type (R, W, RW, R with W)
- data_format : (`AttrDataFormat`) data format (SCALAR, SPECTRUM, IMAGE)
- data_type : (`int`) attribute type (float, string,..)
- max_dim_x : (`int`) first dimension of attribute (spectrum or image attributes)

- max_dim_y : (`int`) second dimension of attribute(image attribute)
- description : (`int`) attribute description
- label : (`str`) attribute label (Voltage, time, ...)
- unit : (`str`) attribute unit (V, ms, ...)
- standard_unit : (`str`) standard unit
- display_unit : (`str`) display unit
- format : (`str`) how to display the attribute value (ex: for floats could be '%6.2f')
- min_value : (`str`) minimum allowed value
- max_value : (`str`) maximum allowed value
- min_alarm : (`str`) low alarm level
- max_alarm : (`str`) high alarm level
- writable_attr_name : (`str`) name of the writable attribute
- extensions : (`StdStringVector`) extensions (currently not used)
- disp_level : (`DispLevel`) display level (OPERATOR, EXPERT)

see also `AttributeInfo`

class `PyTango.`**`DeviceAttributeConfig`**

A base structure containing available information for an attribute with the following members:

- name : (`str`) attribute name
- writable : (`AttrWriteType`) write type (R, W, RW, R with W)
- data_format : (`AttrDataFormat`) data format (SCALAR, SPECTRUM, IMAGE)
- data_type : (`int`) attribute type (float, string,..)
- max_dim_x : (`int`) first dimension of attribute (spectrum or image attributes)
- max_dim_y : (`int`) second dimension of attribute(image attribute)
- description : (`int`) attribute description
- label : (`str`) attribute label (Voltage, time, ...)
- unit : (`str`) attribute unit (V, ms, ...)
- standard_unit : (`str`) standard unit
- display_unit : (`str`) display unit
- format : (`str`) how to display the attribute value (ex: for floats could be '%6.2f')
- min_value : (`str`) minimum allowed value
- max_value : (`str`) maximum allowed value
- min_alarm : (`str`) low alarm level
- max_alarm : (`str`) high alarm level
- writable_attr_name : (`str`) name of the writable attribute
- extensions : (`StdStringVector`) extensions (currently not used)

Command

class `PyTango.`**`DevCommandInfo`**

A device command info with the following members:

- cmd_name : (`str`) command name
- cmd_tag : command as binary value (for TACO)
- in_type : (`CmdArgType`) input type
- out_type : (`CmdArgType`) output type
- in_type_desc : (`str`) description of input type
- out_type_desc : (`str`) description of output type

New in PyTango 7.0.0

class `PyTango.`**`CommandInfo`**

A device command info (inheriting from `DevCommandInfo`) with the following members:

- disp_level : (DispLevel) command display level

Inherited members are (from DevCommandInfo):

- cmd_name : (str) command name
- cmd_tag : (str) command as binary value (for TACO)
- in_type : (CmdArgType) input type
- out_type : (CmdArgType) output type
- in_type_desc : (str) description of input type
- out_type_desc : (str) description of output type

Other

class PyTango.**DeviceInfo**

A structure containing available information for a device with the" following members:

- dev_class : (str) device class
- server_id : (str) server ID
- server_host : (str) host name
- server_version : (str) server version
- doc_url : (str) document url

class PyTango.**LockerInfo**

A structure with information about the locker with the folowing members:

- ll : (PyTango.LockerLanguage) the locker language
- li : (pid_t / UUID) the locker id
- locker_host : (str) the host
- locker_class : (str) the class

pid_t should be an int, UUID should be a tuple of four numbers.

New in PyTango 7.0.0

class PyTango.**PollDevice**

A structure containing PollDevice information with the folowing members:

- dev_name : (str) device name
- ind_list : (sequence<int>) index list

New in PyTango 7.0.0

5.2.7 Storage classes

Attribute: DeviceAttribute

class PyTango.**DeviceAttribute**(*da=None*)

This is the fundamental type for RECEIVING data from device attributes.

It contains several fields. The most important ones depend on the ExtractAs method used to get the value. Normally they are:

- value : Normal scalar value or numpy array of values.
- w_value : The write part of the attribute.

See other ExtractAs for different possibilities. There are some more fields, these really fixed:

- name : (str)
- data_format : (AttrDataFormat) Attribute format
- quality : (AttrQuality)
- time : (TimeVal)
- dim_x : (int) attribute dimension x

- dim_y : (`int`) attribute dimension y
- w_dim_x : (`int`) attribute written dimension x
- w_dim_y : (`int`) attribute written dimension y
- r_rimension : (`tuple`) Attribute read dimensions.
- w_dimension : (`tuple`) Attribute written dimensions.
- nb_read : (`int`) attribute read total length
- nb_written : (`int`) attribute written total length

And two methods:

- get_date
- get_err_stack

`get_date`(*self*) → TimeVal

Get the time at which the attribute was read by the server.

Note: It's the same as reading the "time" attribute.

Parameters None

Return (`TimeVal`) The attribute read timestamp.

`get_err_stack`(*self*) → sequence<DevError>

Returns the error stack reported by the server when the attribute was read.

Parameters None

Return (sequence<`DevError`>)

`set_w_dim_x`(*self*, *val*) → None

Sets the write value dim x.

Parameters

val (`int`) new write dim x

Return None

New in PyTango 8.0.0

`set_w_dim_y`(*self*, *val*) → None

Sets the write value dim y.

Parameters

val (`int`) new write dim y

Return None

New in PyTango 8.0.0

Command: DeviceData

Device data is the type used internally by Tango to deal with command parameters and return values. You don't usually need to deal with it, as command_inout will automatically convert the parameters from any other type and the result value to another type.

You can still use them, using command_inout_raw to get the result in a DeviceData.

You also may deal with it when reading command history.

class PyTango.**DeviceData**
This is the fundamental type for sending and receiving data from device commands. The values can be inserted and extracted using the insert() and extract() methods.

extract (*self*) → any

Get the actual value stored in the DeviceData.

Parameters None

Return Whatever is stored there, or None.

get_type (*self*) → CmdArgType

This method returns the Tango data type of the data inside the DeviceData object.

Parameters None

Return The content arg type.

insert (*self*, *data_type*, *value*) → None

Inserts a value in the DeviceData.

Parameters

data_type

value (any) The value to insert

Return Whatever is stored there, or None.

is_empty (*self*) → bool

It can be used to test whether the DeviceData object has been initialized or not.

Parameters None

Return True or False depending on whether the DeviceData object contains data or not.

5.2.8 Callback related classes

If you subscribe a callback in a DeviceProxy, it will be run with a parameter. This parameter depends will be of one of the following classes depending on the callback type.

class PyTango.**AttrReadEvent**
This class is used to pass data to the callback method in asynchronous callback model for read_attribute(s) execution.
It has the following members:

- device : (DeviceProxy) The DeviceProxy object on which the call was executed
- attr_names : (sequence<str>) The attribute name list
- argout : (DeviceAttribute) The attribute value
- err : (bool) A boolean flag set to true if the command failed. False otherwise
- errors : (sequence<DevError>) The error stack
- ext :

class PyTango.**AttrWrittenEvent**
This class is used to pass data to the callback method in asynchronous callback model for write_attribute(s) execution
It has the following members:

- device : (`DeviceProxy`) The DeviceProxy object on which the call was executed
- attr_names : (sequence<`str`>) The attribute name list
- err : (`bool`) A boolean flag set to true if the command failed. False otherwise
- errors : (`NamedDevFailedList`) The error stack
- ext :

class `PyTango.`**`CmdDoneEvent`**

This class is used to pass data to the callback method in asynchronous callback model for command execution.

It has the following members:

- device : (`DeviceProxy`) The DeviceProxy object on which the call was executed.
- cmd_name : (`str`) The command name
- argout_raw : (`DeviceData`) The command argout
- argout : The command argout
- err : (`bool`) A boolean flag set to true if the command failed. False otherwise
- errors : (sequence<`DevError`>) The error stack
- ext :

5.2.9 Event related classes

Event configuration information

class `PyTango.`**`AttributeEventInfo`**

A structure containing available event information for an attribute with the folowing members:

- ch_event : (`ChangeEventInfo`) change event information
- per_event : (`PeriodicEventInfo`) periodic event information
- arch_event : (`ArchiveEventInfo`) archiving event information

class `PyTango.`**`ArchiveEventInfo`**

A structure containing available archiving event information for an attribute with the folowing members:

- archive_rel_change : (`str`) relative change that will generate an event
- archive_abs_change : (`str`) absolute change that will generate an event
- archive_period : (`str`) archive period
- extensions : (sequence<`str`>) extensions (currently not used)

class `PyTango.`**`ChangeEventInfo`**

A structure containing available change event information for an attribute with the folowing members:

- rel_change : (`str`) relative change that will generate an event
- abs_change : (`str`) absolute change that will generate an event
- extensions : (`StdStringVector`) extensions (currently not used)

class `PyTango.`**`PeriodicEventInfo`**

A structure containing available periodic event information for an attribute with the folowing members:

- period : (`str`) event period
- extensions : (`StdStringVector`) extensions (currently not used)

Event arrived structures

class `PyTango.`**`EventData`**

This class is used to pass data to the callback method when an event is sent to the client. It contains the following public fields:

- device : (`DeviceProxy`) The DeviceProxy object on which the call was executed.
- attr_name : (`str`) The attribute name
- event : (`str`) The event name
- attr_value : (`DeviceAttribute`) The attribute data (DeviceAttribute)
- err : (`bool`) A boolean flag set to true if the request failed. False otherwise
- errors : (sequence<`DevError`>) The error stack
- reception_date: (`TimeVal`)

`get_date`(*self*) → TimeVal

Returns the timestamp of the event.

Parameters None

Return (`TimeVal`) the timestamp of the event

New in PyTango 7.0.0

class `PyTango.`**`AttrConfEventData`**

This class is used to pass data to the callback method when a configuration event is sent to the client. It contains the following public fields:

- device : (`DeviceProxy`) The DeviceProxy object on which the call was executed
- attr_name : (`str`) The attribute name
- event : (`str`) The event name
- attr_conf : (`AttributeInfoEx`) The attribute data
- err : (`bool`) A boolean flag set to true if the request failed. False otherwise
- errors : (sequence<`DevError`>) The error stack
- reception_date: (`TimeVal`)

`get_date`(*self*) → TimeVal

Returns the timestamp of the event.

Parameters None

Return (`TimeVal`) the timestamp of the event

New in PyTango 7.0.0

class `PyTango.`**`DataReadyEventData`**

This class is used to pass data to the callback method when an attribute data ready event is sent to the clien. It contains the following public fields:

- device : (`DeviceProxy`) The DeviceProxy object on which the call was executed
- attr_name : (`str`) The attribute name
- event : (`str`) The event name
- attr_data_type : (`int`) The attribute data type
- ctr : (`int`) The user counter. Set to 0 if not defined when sent by the server
- err : (`bool`) A boolean flag set to true if the request failed. False otherwise
- errors : (sequence<`DevError`>) The error stack
- reception_date: (`TimeVal`)

New in PyTango 7.0.0

`get_date`(*self*) → TimeVal

Returns the timestamp of the event.

Parameters None

Return (`TimeVal`) the timestamp of the event

New in PyTango 7.0.0

5.2.10 History classes

class `PyTango.`**`DeviceAttributeHistory`**
Bases: `PyTango._PyTango.DeviceAttribute`

See `DeviceAttribute`.

class `PyTango.`**`DeviceDataHistory`**
Bases: `PyTango._PyTango.DeviceData`

See `DeviceData`.

5.2.11 Enumerations & other classes

Enumerations

class `PyTango.`**`LockerLanguage`**
An enumeration representing the programming language in which the client application who locked is written.

- CPP : C++/Python language
- JAVA : Java language

New in PyTango 7.0.0

class `PyTango.`**`CmdArgType`**
An enumeration representing the command argument type.

- DevVoid
- DevBoolean
- DevShort
- DevLong
- DevFloat
- DevDouble
- DevUShort
- DevULong
- DevString
- DevVarCharArray
- DevVarShortArray
- DevVarLongArray
- DevVarFloatArray
- DevVarDoubleArray
- DevVarUShortArray
- DevVarULongArray
- DevVarStringArray
- DevVarLongStringArray
- DevVarDoubleStringArray
- DevState
- ConstDevString
- DevVarBooleanArray
- DevUChar
- DevLong64
- DevULong64
- DevVarLong64Array
- DevVarULong64Array
- DevInt

- DevEncoded

class `PyTango.`**`MessBoxType`**

An enumeration representing the MessBoxType

- STOP
- INFO

New in PyTango 7.0.0

class `PyTango.`**`PollObjType`**

An enumeration representing the PollObjType

- POLL_CMD
- POLL_ATTR
- EVENT_HEARTBEAT
- STORE_SUBDEV

New in PyTango 7.0.0

class `PyTango.`**`PollCmdCode`**

An enumeration representing the PollCmdCode

- POLL_ADD_OBJ
- POLL_REM_OBJ
- POLL_START
- POLL_STOP
- POLL_UPD_PERIOD
- POLL_REM_DEV
- POLL_EXIT
- POLL_REM_EXT_TRIG_OBJ
- POLL_ADD_HEARTBEAT
- POLL_REM_HEARTBEAT

New in PyTango 7.0.0

class `PyTango.`**`SerialModel`**

An enumeration representing the type of serialization performed by the device server

- BY_DEVICE
- BY_CLASS
- BY_PROCESS
- NO_SYNC

class `PyTango.`**`AttReqType`**

An enumeration representing the type of attribute request

- READ_REQ
- WRITE_REQ

class `PyTango.`**`LockCmdCode`**

An enumeration representing the LockCmdCode

- LOCK_ADD_DEV
- LOCK_REM_DEV
- LOCK_UNLOCK_ALL_EXIT
- LOCK_EXIT

New in PyTango 7.0.0

class `PyTango.`**`LogLevel`**

An enumeration representing the LogLevel

- LOG_OFF
- LOG_FATAL
- LOG_ERROR
- LOG_WARN
- LOG_INFO
- LOG_DEBUG

New in PyTango 7.0.0

class `PyTango.`**`LogTarget`**

An enumeration representing the LogTarget

- LOG_CONSOLE
- LOG_FILE
- LOG_DEVICE

New in PyTango 7.0.0

class `PyTango.`**`EventType`**

An enumeration representing event type

- CHANGE_EVENT
- QUALITY_EVENT
- PERIODIC_EVENT
- ARCHIVE_EVENT
- USER_EVENT
- ATTR_CONF_EVENT
- DATA_READY_EVENT

DATA_READY_EVENT - New in PyTango 7.0.0

class `PyTango.`**`KeepAliveCmdCode`**

An enumeration representing the KeepAliveCmdCode

- EXIT_TH

New in PyTango 7.0.0

class `PyTango.`**`AccessControlType`**

An enumeration representing the AccessControlType

- ACCESS_READ
- ACCESS_WRITE

New in PyTango 7.0.0

class `PyTango.`**`asyn_req_type`**

An enumeration representing the asynchronous request type

- POLLING
- CALLBACK
- ALL_ASYNCH

class `PyTango.`**`cb_sub_model`**

An enumeration representing callback sub model

- PUSH_CALLBACK
- PULL_CALLBACK

class `PyTango.`**`AttrQuality`**

An enumeration representing the attribute quality

- ATTR_VALID
- ATTR_INVALID
- ATTR_ALARM
- ATTR_CHANGING
- ATTR_WARNING

class `PyTango.`**`AttrWriteType`**

An enumeration representing the attribute type

- READ
- READ_WITH_WRITE
- WRITE
- READ_WRITE

class `PyTango.`**`AttrDataFormat`**

An enumeration representing the attribute format

- SCALAR
- SPECTRUM
- IMAGE
- FMT_UNKNOWN

class `PyTango.`**`DevSource`**

An enumeration representing the device source for data

- DEV
- CACHE
- CACHE_DEV

class `PyTango.`**`ErrSeverity`**

An enumeration representing the error severity

- WARN
- ERR
- PANIC

class `PyTango.`**`DevState`**

An enumeration representing the device state

- ON
- OFF
- CLOSE
- OPEN
- INSERT
- EXTRACT
- MOVING
- STANDBY
- FAULT
- INIT
- RUNNING
- ALARM
- DISABLE
- UNKNOWN

class `PyTango.`**`DispLevel`**

An enumeration representing the display level

- OPERATOR
- EXPERT

class `PyTango.`**`GreenMode`**

An enumeration representing the GreenMode

- Synchronous
- Futures
- Gevent

New in PyTango 8.1.0

Other classes

class `PyTango.`**`Release`**

Release information:

- name : (`str`) package name
- version_info : (`tuple`) The five components of the version number: major, minor, micro, releaselevel, and serial.
- version : (`str`) package version in format <major>.<minor>.<micro>
- version_long : (`str`) package version in format <major>.<minor>.<micro><releaselevel><serial>
- version_description : (`str`) short description for the current version
- version_number : (`int`) <major>*100 + <minor>*10 + <micro>
- description : (`str`) package description
- long_description : (`str`) longer package description

- authors : (dict<str(last name), tuple<str(full name),str(email)>>) package authors
- url : (`str`) package url
- download_url : (`str`) package download url
- platform : (`seq`) list of available platforms
- keywords : (`seq`) list of keywords
- license : (`str`) the license

class `PyTango.`**`TimeVal`**(*a=None*, *b=None*, *c=None*)

Time value structure with the following members:

- tv_sec : seconds
- tv_usec : microseconds
- tv_nsec : nanoseconds

static **`fromdatetime`**(*dt*) → TimeVal

A static method returning a `PyTango.TimeVal` object representing the given `datetime.datetime`

Parameters

dt (`datetime.datetime`) a datetime object

Return (`TimeVal`) representing the given timestamp

New in version 7.1.0.

New in version 7.1.2: Documented

static **`fromtimestamp`**(*ts*) → TimeVal

A static method returning a `PyTango.TimeVal` object representing the given timestamp

Parameters

ts (`float`) a timestamp

Return (`TimeVal`) representing the given timestamp

New in version 7.1.0.

`isoformat`(*self*, *sep='T'*) → str

Returns a string in ISO 8601 format, YYYY-MM-DDTHH:MM:SS[.mmmmmm][+HH:MM]

Parameters sep : (str) sep is used to separate the year from the time, and defaults to 'T'

Return (`str`) a string representing the time according to a format specification.

New in version 7.1.0.

New in version 7.1.2: Documented

Changed in version 7.1.2: The *sep* parameter is not mandatory anymore and defaults to 'T' (same as `datetime.datetime.isoformat()`)

static **`now`**() → TimeVal

A static method returning a `PyTango.TimeVal` object representing the current time

Parameters None

Return (`TimeVal`) representing the current time

New in version 7.1.0.

New in version 7.1.2: Documented

strftime (*self*, *format*) → str

Convert a time value to a string according to a format specification.

Parameters format : (str) See the python library reference manual for formatting codes

Return (str) a string representing the time according to a format specification.

New in version 7.1.0.

New in version 7.1.2: Documented

todatetime (*self*) → datetime.datetime

Returns a `datetime.datetime` object representing the same time value

Parameters None

Return (`datetime.datetime`) the time value in datetime format

New in version 7.1.0.

totime (*self*) → float

Returns a float representing this time value

Parameters None

Return a float representing the time value

New in version 7.1.0.

5.3 Server API

5.3.1 High level server API

Server helper classes for writing Tango device servers.

- `Device`
- `attribute`
- `command`
- `device_property`
- `class_property`
- `run()`
- `server_run()`

This module provides a high level device server API. It implements *TEP1*. It exposes an easier API for developing a Tango device server.

Here is a simple example on how to write a *Clock* device server using the high level API:

```
import time
from PyTango.server import run
from PyTango.server import Device, DeviceMeta
from PyTango.server import attribute, command


class Clock(Device):
    __metaclass__ = DeviceMeta
    time = attribute()

    def read_time(self):
        return time.time()

    @command(din_type=str, dout_type=str)
    def strftime(self, format):
        return time.strftime(format)


if __name__ == "__main__":
    run((Clock,))
```

Here is a more complete example on how to write a *PowerSupply* device server using the high level API. The example contains:

1. a read-only double scalar attribute called *voltage*
2. a read/write double scalar expert attribute *current*
3. a read-only double image attribute called *noise*
4. a *ramp* command
5. a *host* device property
6. a *port* class property

```
from time import time
from numpy.random import random_sample

from PyTango import AttrQuality, AttrWriteType, DispLevel, server_run
from PyTango.server import Device, DeviceMeta, attribute, command
from PyTango.server import class_property, device_property

class PowerSupply(Device):
    __metaclass__ = DeviceMeta

    voltage = attribute()

    current = attribute(label="Current", dtype=float,
                        display_level=DispLevel.EXPERT,
                        access=AttrWriteType.READ_WRITE,
                        unit="A", format="8.4f",
                        min_value=0.0, max_value=8.5,
                        min_alarm=0.1, max_alarm=8.4,
                        min_warning=0.5, max_warning=8.0,
                        fget="get_current", fset="set_current",
                        doc="the power supply current")

    noise = attribute(label="Noise", dtype=((float,),),
                      max_dim_x=1024, max_dim_y=1024,
                      fget="get_noise")

    host = device_property(dtype=str)
    port = class_property(dtype=int, default_value=9788)

    def read_voltage(self):
        self.info_stream("get voltage(%s, %d)" % (self.host, self.port))
        return 10.0

    def get_current(self):
        return 2.3456, time(), AttrQuality.ATTR_WARNING
```

```python

    def set_current(self, current):
        print("Current set to %f" % current)

    def get_noise(self):
        return random_sample((1024, 1024))

    @command(dtype_in=float)
    def ramp(self, value):
        print("Ramping up...")

if __name__ == "__main__":
    server_run((PowerSupply,))
```

Pretty cool, uh?

Note: the `__metaclass__` statement is mandatory due to a limitation in the *boost-python* library used by PyTango.

If you are using python 3 you can write instead:

```python
class PowerSupply(Device, metaclass=DeviceMeta)
    pass
```

Data types

When declaring attributes, properties or commands, one of the most important information is the data type. It is given by the keyword argument *dtype*. In order to provide a more *pythonic* interface, this argument is not restricted to the `CmdArgType` options.

For example, to define a *SCALAR* `DevLong` attribute you have several possibilities:

1. `int`
2. 'int'
3. 'int32'
4. 'integer'
5. `PyTango.CmdArgType.DevLong`
6. 'DevLong'
7. `numpy.int32`

To define a *SPECTRUM* attribute simply wrap the scalar data type in any python sequence:

- using a *tuple*: `(:obj:`int`,)` or
- using a *list*: `[:obj:`int`]` or
- any other sequence type

To define an *IMAGE* attribute simply wrap the scalar data type in any python sequence of sequences:

- using a *tuple*: `((:obj:`int`,),)` or
- using a *list*: `[[:obj:`int`]]` or
- any other sequence type

Below is the complete table of equivalences.

dtype argument	converts to tango type
None	DevVoid
'None'	DevVoid
DevVoid	DevVoid
'DevVoid'	DevVoid
DevState	DevState
'DevState'	DevState
bool	DevBoolean
'bool'	DevBoolean
'boolean'	DevBoolean
DevBoolean	DevBoolean
'DevBoolean'	DevBoolean
numpy.bool_	DevBoolean
'char'	DevUChar
'chr'	DevUChar
'byte'	DevUChar
chr	DevUChar
DevUChar	DevUChar
'DevUChar'	DevUChar
numpy.uint8	DevUChar
'int16'	DevShort
DevShort	DevShort
'DevShort'	DevShort
numpy.int16	DevShort
'uint16'	DevUShort
DevUShort	DevUShort
'DevUShort'	DevUShort
numpy.uint16	DevUShort
int	DevLong
'int'	DevLong
'int32'	DevLong
DevLong	DevLong
'DevLong'	DevLong
numpy.int32	DevLong
'uint'	DevULong
'uint32'	DevULong
DevULong	DevULong
'DevULong'	DevULong
numpy.uint32	DevULong
'int64'	DevLong64
DevLong64	DevLong64
'DevLong64'	DevLong64
numpy.int64	DevLong64
'uint64'	DevULong64
DevULong64	DevULong64
'DevULong64'	DevULong64
numpy.uint64	DevULong64
DevInt	DevInt
'DevInt'	DevInt
'float32'	DevFloat
DevFloat	DevFloat
'DevFloat'	DevFloat
numpy.float32	DevFloat
float	DevDouble
'double'	DevDouble

Continued on next page

Table 5.2 – continued from previous page

dtype argument	converts to tango type
'float'	DevDouble
'float64'	DevDouble
DevDouble	DevDouble
'DevDouble'	DevDouble
numpy.float64	DevDouble
str	DevString
'str'	DevString
'string'	DevString
'text'	DevString
DevString	DevString
'DevString'	DevString
bytearray	DevEncoded
'bytearray'	DevEncoded
'bytes'	DevEncoded
DevEncoded	DevEncoded
'DevEncoded'	DevEncoded
DevVarBooleanArray	DevVarBooleanArray
'DevVarBooleanArray'	DevVarBooleanArray
DevVarCharArray	DevVarCharArray
'DevVarCharArray'	DevVarCharArray
DevVarShortArray	DevVarShortArray
'DevVarShortArray'	DevVarShortArray
DevVarLongArray	DevVarLongArray
'DevVarLongArray'	DevVarLongArray
DevVarLong64Array	DevVarLong64Array
'DevVarLong64Array'	DevVarLong64Array
DevVarULong64Array	DevVarULong64Array
'DevVarULong64Array'	DevVarULong64Array
DevVarFloatArray	DevVarFloatArray
'DevVarFloatArray'	DevVarFloatArray
DevVarDoubleArray	DevVarDoubleArray
'DevVarDoubleArray'	DevVarDoubleArray
DevVarUShortArray	DevVarUShortArray
'DevVarUShortArray'	DevVarUShortArray
DevVarULongArray	DevVarULongArray
'DevVarULongArray'	DevVarULongArray
DevVarStringArray	DevVarStringArray
'DevVarStringArray'	DevVarStringArray
DevVarLongStringArray	DevVarLongStringArray
'DevVarLongStringArray'	DevVarLongStringArray
DevVarDoubleStringArray	DevVarDoubleStringArray
'DevVarDoubleStringArray'	DevVarDoubleStringArray

class `PyTango.server.`**`Device`**(*cl, name*)

Bases: `PyTango._PyTango.Device_4Impl`

High level DeviceImpl API. All Device specific classes should inherit from this class.

`add_attribute`(*self, attr, r_meth=None, w_meth=None, is_allo_meth=None*) → Attr

Add a new attribute to the device attribute list. Please, note that if you add an attribute to a device at device creation time, this attribute will be added to the device class attribute list. Therefore, all devices belonging to the same class created after this attribute addition will also have this attribute.

Parameters

attr (Attr or AttrData) the new attribute to be added to the list.

r_meth (`callable`) the read method to be called on a read request

w_meth (`callable`) the write method to be called on a write request (if attr is writable)

is_allo_meth (`callable`) the method that is called to check if it is possible to access the attribute or not

Return (`Attr`) the newly created attribute.

Throws `DevFailed`

`always_executed_hook`()

Tango always_executed_hook. Default implementation does nothing

`append_status`(*self*, *status*, *new_line=False*) → None

Appends a string to the device status.

Parameters status : (str) the string to be appened to the device status new_line : (bool) If true, appends a new line character before the string. Default is False

Return None

`check_command_exists`(*self*) → None

This method check that a command is supported by the device and does not need input value. The method throws an exception if the command is not defined or needs an input value

Parameters

cmd_name (`str`) the command name

Return None

Throws `DevFailed` API_IncompatibleCmdArgumentType, API_CommandNotFound

New in PyTango 7.1.2

`debug_stream`(*self*, *msg*, **args*) → None

Sends the given message to the tango debug stream.

Since PyTango 7.1.3, the same can be achieved with:

```
print(msg, file=self.log_debug)
```

Parameters

msg (`str`) the message to be sent to the debug stream

Return None

`dev_state`(*self*) → DevState

Get device state. Default method to get device state. The behaviour of this method depends on the device state. If the device state is ON or ALARM, it reads the attribute(s) with an alarm level defined, check if the read value is above/below the alarm and eventually change the state to ALARM, return the device state. For all th other device state, this method simply returns the state

This method can be redefined in sub-classes in case of the default behaviour does not fullfill the needs.

Parameters None

Return (`DevState`) the device state

Throws `DevFailed` - If it is necessary to read attribute(s) and a problem occurs during the reading

`dev_status`(*self*) → str

Get device status. Default method to get device status. It returns the contents of the device dev_status field. If the device state is ALARM, alarm messages are added to the device status. This method can be redefined in sub-classes in case of the default behaviour does not fullfill the needs.

Parameters None

Return (`str`) the device status

Throws `DevFailed` - If it is necessary to read attribute(s) and a problem occurs during the reading

`error_stream`(*self*, *msg*, **args*) → None

Sends the given message to the tango error stream.

Since PyTango 7.1.3, the same can be achieved with:

```
print(msg, file=self.log_error)
```

Parameters

msg (`str`) the message to be sent to the error stream

Return None

`fatal_stream`(*self*, *msg*, **args*) → None

Sends the given message to the tango fatal stream.

Since PyTango 7.1.3, the same can be achieved with:

```
print(msg, file=self.log_fatal)
```

Parameters

msg (`str`) the message to be sent to the fatal stream

Return None

`get_attr_min_poll_period`(*self*) → seq<str>

Returns the min attribute poll period

Parameters None

Return (`seq`) the min attribute poll period

New in PyTango 7.2.0

`get_attr_poll_ring_depth`(*self*, *attr_name*) → int

Returns the attribute poll ring depth

Parameters

attr_name (`str`) the attribute name

Return (`int`) the attribute poll ring depth

New in PyTango 7.1.2

`get_attribute_poll_period`(*self*, *attr_name*) → int

Returns the attribute polling period (ms) or 0 if the attribute is not polled.

Parameters

attr_name (`str`) attribute name

Return (`int`) attribute polling period (ms) or 0 if it is not polled

New in PyTango 8.0.0

`get_cmd_min_poll_period`(*self*) → seq<str>

Returns the min command poll period

Parameters None

Return (`seq`) the min command poll period

New in PyTango 7.2.0

`get_cmd_poll_ring_depth`(*self*, *cmd_name*) → int

Returns the command poll ring depth

Parameters

cmd_name (`str`) the command name

Return (`int`) the command poll ring depth

New in PyTango 7.1.2

`get_command_poll_period`(*self*, *cmd_name*) → int

Returns the command polling period (ms) or 0 if the command is not polled.

Parameters

cmd_name (`str`) command name

Return (`int`) command polling period (ms) or 0 if it is not polled

New in PyTango 8.0.0

`get_dev_idl_version`(*self*) → int

Returns the IDL version

Parameters None

Return (`int`) the IDL version

New in PyTango 7.1.2

`get_device_attr`(*self*) → MultiAttribute

Get device multi attribute object.

Parameters None

Return (`MultiAttribute`) the device's MultiAttribute object

`get_device_properties`(*self, ds_class = None*) → None

Utility method that fetches all the device properties from the database and converts them into members of this DeviceImpl.

Parameters

ds_class (`DeviceClass`) the DeviceClass object. Optional. Default value is None meaning that the corresponding DeviceClass object for this DeviceImpl will be used

Return None

Throws `DevFailed`

`get_exported_flag`(*self*) → bool

Returns the state of the exported flag

Parameters None

Return (`bool`) the state of the exported flag

New in PyTango 7.1.2

`get_logger`(*self*) → Logger

Returns the Logger object for this device

Parameters None

Return (`Logger`) the Logger object for this device

`get_min_poll_period`(*self*) → int

Returns the min poll period

Parameters None

Return (`int`) the min poll period

New in PyTango 7.2.0

`get_name`(*self) -> (str*)

Get a COPY of the device name.

Parameters None

Return (`str`) the device name

`get_non_auto_polled_attr`(*self*) → sequence<str>

Returns a COPY of the list of non automatic polled attributes

Parameters None

Return (sequence<`str`>) a COPY of the list of non automatic polled attributes

New in PyTango 7.1.2

`get_non_auto_polled_cmd`(*self*) → sequence<str>

Returns a COPY of the list of non automatic polled commands

Parameters None

Return (sequence<`str`>) a COPY of the list of non automatic polled commands

New in PyTango 7.1.2

`get_poll_old_factor`(*self*) → int

Returns the poll old factor

Parameters None

Return (`int`) the poll old factor

New in PyTango 7.1.2

`get_poll_ring_depth`(*self*) → int

Returns the poll ring depth

Parameters None

Return (`int`) the poll ring depth

New in PyTango 7.1.2

`get_polled_attr`(*self*) → sequence<str>

Returns a COPY of the list of polled attributes

Parameters None

Return (sequence<`str`>) a COPY of the list of polled attributes

New in PyTango 7.1.2

`get_polled_cmd`(*self*) → sequence<str>

Returns a COPY of the list of polled commands

Parameters None

Return (sequence<`str`>) a COPY of the list of polled commands

New in PyTango 7.1.2

`get_prev_state`(*self*) → DevState

Get a COPY of the device's previous state.

Parameters None

Return (`DevState`) the device's previous state

`get_state`(*self*) → DevState

Get a COPY of the device state.

Parameters None

Return (`DevState`) Current device state

`get_status`(*self*) → str

Get a COPY of the device status.

Parameters None

Return (`str`) the device status

`info_stream`(*self*, *msg*, **args*) → None

Sends the given message to the tango info stream.

Since PyTango 7.1.3, the same can be achieved with:

```
print(msg, file=self.log_info)
```

Parameters

msg (`str`) the message to be sent to the info stream

Return None

`init_device`()

Tango init_device method. Default implementation calls `get_device_properties()`

`initialize_dynamic_attributes`()

Method executed at initializion phase to create dynamic attributes. Default implementation does nothing. Overwrite when necessary.

`is_device_locked`(*self*) → bool

Returns if this device is locked by a client

Parameters None

Return (`bool`) True if it is locked or False otherwise

New in PyTango 7.1.2

`is_polled`(*self*) → bool

Returns if it is polled

Parameters None

Return (`bool`) True if it is polled or False otherwise

New in PyTango 7.1.2

`push_archive_event`(*self*, *attr_name*) → None

push_archive_event *(self, attr_name, except)* **->** `None`

push_archive_event *(self, attr_name, data, dim_x = 1, dim_y = 0)* **->** `None`

push_archive_event *(self, attr_name, str_data, data)* **->** `None`

push_archive_event *(self, attr_name, data, time_stamp, quality, dim_x = 1, dim_y = 0)* **->** `None`

push_archive_event *(self, attr_name, str_data, data, time_stamp, quality)* **->** `None`

Push an archive event for the given attribute name. The event is pushed to the notification daemon.

Parameters

attr_name (`str`) attribute name

data the data to be sent as attribute event data. Data must be compatible with the attribute type and format. for SPECTRUM and IMAGE attributes, data can be any type of sequence of elements compatible with the attribute type

str_data (`str`) special variation for DevEncoded data type. In this case 'data' must be a str or an object with the buffer interface.

except (`DevFailed`) Instead of data, you may want to send an exception.

dim_x (`int`) the attribute x length. Default value is 1

dim_y (`int`) the attribute y length. Default value is 0

time_stamp (`double`) the time stamp

quality (`AttrQuality`) the attribute quality factor

Throws `DevFailed` If the attribute data type is not coherent.

`push_att_conf_event`(*self, attr*) → None

Push an attribute configuration event.

Parameters (Attribute) the attribute for which the configuration event will be sent.

Return None

New in PyTango 7.2.1

`push_change_event`(*self, attr_name*) → None

push_change_event *(self, attr_name, except)* **->** `None`

push_change_event *(self, attr_name, data, dim_x = 1, dim_y = 0)* **->** `None`

push_change_event *(self, attr_name, str_data, data)* **->** `None`

push_change_event *(self, attr_name, data, time_stamp, quality, dim_x = 1, dim_y = 0)* **->** `None`

push_change_event *(self, attr_name, str_data, data, time_stamp, quality)* **->** `None`

Push a change event for the given attribute name. The event is pushed to the notification daemon.

Parameters

attr_name (`str`) attribute name

data the data to be sent as attribute event data. Data must be compatible with the attribute type and format. for SPECTRUM and IMAGE attributes, data can be any type of sequence of elements compatible with the attribute type

str_data (`str`) special variation for DevEncoded data type. In this case 'data' must be a str or an object with the buffer interface.

except (`DevFailed`) Instead of data, you may want to send an exception.

dim_x (`int`) the attribute x length. Default value is 1

dim_y (`int`) the attribute y length. Default value is 0

time_stamp (`double`) the time stamp

quality (`AttrQuality`) the attribute quality factor

Throws `DevFailed` If the attribute data type is not coherent.

`push_data_ready_event`(*self, attr_name, counter = 0*) → None

Push a data ready event for the given attribute name. The event is pushed to the notification daemon.

The method needs only the attribue name and an optional "counter" which will be passed unchanged within the event

Parameters

attr_name (`str`) attribute name

counter (`int`) the user counter

Return None

Throws `DevFailed` If the attribute name is unknown.

`push_event` (*self, attr_name, filt_names, filt_vals*) → None

push_event *(self, attr_name, filt_names, filt_vals, data, dim_x = 1, dim_y = 0)* **->** `None`

push_event *(self, attr_name, filt_names, filt_vals, str_data, data)* **->** `None`

push_event *(self, attr_name, filt_names, filt_vals, data, time_stamp, quality, dim_x = 1, dim_y = 0)* **->** `None`

push_event *(self, attr_name, filt_names, filt_vals, str_data, data, time_stamp, quality)* **->** `None`

Push a user event for the given attribute name. The event is pushed to the notification daemon.

Parameters

attr_name (`str`) attribute name

filt_names (sequence<`str`>) the filterable fields name

filt_vals (sequence<`double`>) the filterable fields value

data the data to be sent as attribute event data. Data must be compatible with the attribute type and format. for SPECTRUM and IMAGE attributes, data can be any type of sequence of elements compatible with the attribute type

str_data (`str`) special variation for DevEncoded data type. In this case 'data' must be a str or an object with the buffer interface.

dim_x (`int`) the attribute x length. Default value is 1

dim_y (`int`) the attribute y length. Default value is 0

time_stamp (`double`) the time stamp

quality (`AttrQuality`) the attribute quality factor

Throws `DevFailed` If the attribute data type is not coherent.

`read_attr_hardware` (*self, attr_list*) → None

Read the hardware to return attribute value(s). Default method to implement an action necessary on a device to read the hardware involved in a a read attribute CORBA call. This method must be redefined in sub-classes in order to support attribute reading

Parameters

attr_list [(sequence<int>) list of indices in the device object attribute vector] of an attribute to be read.

Return None

Throws `DevFailed` This method does not throw `exception` but a redefined method can.

`register_signal`(*self*, *signo*) → None

Register a signal. Register this device as device to be informed when signal signo is sent to to the device server process

Parameters

signo (`int`) signal identifier

Return None

`remove_attribute`(*self*, *attr_name*) → None

Remove one attribute from the device attribute list.

Parameters

attr_name (`str`) attribute name

Return None

Throws `DevFailed`

`set_archive_event`(*self*, *attr_name*, *implemented*, *detect=True*) → None

Set an implemented flag for the attribute to indicate that the server fires archive events manually, without the polling to be started. If the detect parameter is set to true, the criteria specified for the archive event are verified and the event is only pushed if they are fullfilled. If detect is set to false the event is fired without any value checking!

Parameters

attr_name (`str`) attribute name

implemented (`bool`) True when the server fires change events manually.

detect (`bool`) Triggers the verification of the change event properties when set to true. Default value is true.

Return None

`set_change_event`(*self*, *attr_name*, *implemented*, *detect=True*) → None

Set an implemented flag for the attribute to indicate that the server fires change events manually, without the polling to be started. If the detect parameter is set to true, the criteria specified for the change event are verified and the event is only pushed if they are fullfilled. If detect is set to false the event is fired without any value checking!

Parameters

attr_name (`str`) attribute name

implemented (`bool`) True when the server fires change events manually.

detect (`bool`) Triggers the verification of the change event properties when set to true. Default value is true.

Return None

set_state(*self*, *new_state*) → None

Set device state.

Parameters

new_state (`DevState`) the new device state

Return None

set_status(*self*, *new_status*) → None

Set device status.

Parameters

new_status (`str`) the new device status

Return None

signal_handler(*self*, *signo*) → None

Signal handler. The method executed when the signal arrived in the device server process. This method is defined as virtual and then, can be redefined following device needs.

Parameters

signo (`int`) the signal number

Return None

Throws `DevFailed` This method does not throw `exception` but a redefined method can.

stop_polling(*self*) → None
stop_polling *(self, with_db_upd)* **->** `None`

Stop all polling for a device. if the device is polled, call this method before deleting it.

Parameters

with_db_upd (`bool`) Is it necessary to update db ?

Return None

New in PyTango 7.1.2

unregister_signal(*self*, *signo*) → None

Unregister a signal. Unregister this device as device to be informed when signal signo is sent to to the device server process

Parameters

signo (`int`) signal identifier

Return None

warn_stream(*self*, *msg*, **args*) → None

Sends the given message to the tango warn stream.

Since PyTango 7.1.3, the same can be achieved with:

```
print(msg, file=self.log_warn)
```

Parameters

msg (str) the message to be sent to the warn stream

Return None

write_attr_hardware(*self*) → None

Write the hardware for attributes. Default method to implement an action necessary on a device to write the hardware involved in a a write attribute. This method must be redefined in sub-classes in order to support writable attribute

Parameters

attr_list [(sequence<int>) list of indices in the device object attribute vector] of an attribute to be written.

Return None

Throws DevFailed This method does not throw exception but a redefined method can.

class PyTango.server.**attribute**(*fget=None*, ***kwargs*)

Declares a new tango attribute in a Device. To be used like the python native property function. For example, to declare a scalar, *PyTango.DevDouble*, read-only attribute called *voltage* in a *PowerSupply* Device do:

```
class PowerSupply(Device):
    __metaclass__ = DeviceMeta

    voltage = attribute()

    def read_voltage(self):
        return 999.999
```

The same can be achieved with:

```
class PowerSupply(Device):
    __metaclass__ = DeviceMeta

    @attribute
    def voltage(self):
        return 999.999
```

It receives multiple keyword arguments.

parameter	type	default value	description
name	str	class member name	alternative attribute name
dtype	object	DevDouble	data type (see *Data type equivalence*)
dformat	AttrDataFormat	SCALAR	data format
max_dim_x	int	1	maximum size for x dimension (ignored for
max_dim_y	int	0	maximum size for y dimension (ignored for
display_level	DispLevel	OPERATOR	display level
polling_period	int	-1	polling period
memorized	bool	False	attribute should or not be memorized
hw_memorized	bool	False	write method should be called at startup wh
access	AttrWriteType	READ	read only/ read write / write only access
fget (or fread)	str or callable	'read_<attr_name>'	read method name or method object

Continued on next page

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parameter	type	default value	description
fset (or fwrite)	`str` or `callable`	'write_<attr_name>'	write method name or method object
is_allowed	`str` or `callable`	'is_<attr_name>_allowed'	is allowed method name or method object
label	`str`	'<attr_name>'	attribute label
doc (or description)	`str`	''	attribute description
unit	`str`	''	physical units the attribute value is in
standard_unit	`str`	''	physical standard unit
display_unit	`str`	''	physical display unit (hint for clients)
format	`str`	'6.2f'	attribute representation format
min_value	`str`	None	minimum allowed value
max_value	`str`	None	maximum allowed value
min_alarm	`str`	None	minimum value to trigger attribute alarm
max_alarm	`str`	None	maximum value to trigger attribute alarm
min_warning	`str`	None	minimum value to trigger attribute warning
max_warning	`str`	None	maximum value to trigger attribute warning
delta_val	`str`	None	
delta_t	`str`	None	
abs_change	`str`	None	minimum value change between events that
rel_change	`str`	None	minimum relative change between events th
period	`str`	None	
archive_abs_change	`str`	None	
archive_rel_change	`str`	None	
archive_period	`str`	None	

Note: avoid using *dformat* parameter. If you need a SPECTRUM attribute of say, boolean type, use instead `dtype=(bool,)`.

Example of a integer writable attribute with a customized label, unit and description:

```python
class PowerSupply(Device):
    __metaclass__ = DeviceMeta

    current = attribute(label="Current", unit="mA", dtype=int,
                        access=AttrWriteType.READ_WRITE,
                        doc="the power supply current")

    def init_device(self):
        Device.init_device(self)
        self._current = -1

    def read_current(self):
        return self._current

    def write_current(self, current):
        self._current = current
```

The same, but using attribute as a decorator:

```python
class PowerSupply(Device):
    __metaclass__ = DeviceMeta

    def init_device(self):
        Device.init_device(self)
        self._current = -1
    @attribute(label="Current", unit="mA", dtype=int)
    def current(self):
        """the power supply current"""
        return 999.999

    @current.write
    def current(self, current):
        self._current = current
```

In this second format, defining the *write* implies setting the attribute access to READ_WRITE.

`PyTango.server.`**`command`**(*f=None, dtype_in=None, dformat_in=None, doc_in='', dtype_out=None, dformat_out=None, doc_out=''*)

Declares a new tango command in a `Device`. To be used like a decorator in the methods you want to declare as tango commands. The following example declares commands:

- *void TurnOn(void)*
- *void Ramp(DevDouble current)*
- *DevBool Pressurize(DevDouble pressure)*

```
class PowerSupply(Device):
    __metaclass__ = DeviceMeta

    @command
    def TurnOn(self):
        self.info_stream('Turning on the power supply')

    @command(dtype_in=float)
    def Ramp(self, current):
        self.info_stream('Ramping on %f...' % current)

    @command(dtype_in=float, doc_in='the pressure to be set',
             dtype_out=bool, doc_out='True if it worked, False otherwise')
    def Pressurize(self, pressure):
        self.info_stream('Pressurizing to %f...' % pressure)
```

Note: avoid using *dformat* parameter. If you need a SPECTRUM attribute of say, boolean type, use instead `dtype=(bool,)`.

Parameters

- **`dtype_in`** – a *data type* describing the type of parameter. Default is None meaning no parameter.
- **`dformat_in`** (*AttrDataFormat*) – parameter data format. Default is None.
- **`doc_in`** (*str*) – parameter documentation
- **`dtype_out`** – a *data type* describing the type of return value. Default is None meaning no return value.
- **`dformat_out`** (*AttrDataFormat*) – return value data format. Default is None.
- **`doc_out`** (*str*) – return value documentation

class `PyTango.server.`**`device_property`**(*dtype, doc='', default_value=None*)

Declares a new tango device property in a `Device`. To be used like the python native `property` function. For example, to declare a scalar, *PyTango.DevString*, device property called *host* in a *PowerSupply* `Device` do:

```
from PyTango.server import Device, DeviceMeta
from PyTango.server import device_property

class PowerSupply(Device):
    __metaclass__ = DeviceMeta

    host = device_property(dtype=str)
```

Parameters

- **dtype** – Data type (see *Data types*)
- **doc** – property documentation (optional)
- **default_value** – default value for the property (optional)

class `PyTango.server.`**`class_property`**(*dtype, doc='', default_value=None*)

Declares a new tango class property in a `Device`. To be used like the python native `property` function. For example, to declare a scalar, *PyTango.DevString*, class property called *port* in a *PowerSupply* `Device` do:

```
from PyTango.server import Device, DeviceMeta
from PyTango.server import class_property

class PowerSupply(Device):
    __metaclass__ = DeviceMeta

    port = class_property(dtype=int, default_value=9788)
```

Parameters

- **dtype** – Data type (see *Data types*)
- **doc** – property documentation (optional)
- **default_value** – default value for the property (optional)

`PyTango.server.`**`run`**(*classes, args=None, msg_stream=<open file '<stdout>', mode 'w' at 0x7f71b2ae91e0>, verbose=False, util=None, event_loop=None, post_init_callback=None, green_mode=None*)

Provides a simple way to run a tango server. It handles exceptions by writting a message to the msg_stream.

The *classes* parameter can be either a sequence of:

- : class:~*PyTango.server.Device* or
- a sequence of two elements `DeviceClass`, `DeviceImpl` or
- a sequence of three elements `DeviceClass`, `DeviceImpl`, tango class name (str)

or a dictionary where:

- key is the tango class name
- **value is either:**
  - a : class:~*PyTango.server.Device* class or
  - a sequence of two elements `DeviceClass`, `DeviceImpl` or
  - a sequence of three elements `DeviceClass`, `DeviceImpl`, tango class name (str)

The optional *post_init_callback* can be a callable (without arguments) or a tuple where the first element is the callable, the second is a list of arguments (optional) and the third is a dictionary of keyword arguments (also optional).

Note: the order of registration of tango classes defines the order tango uses to initialize the corresponding devices. if using a dictionary as argument for classes be aware that the order of registration becomes arbitrary. If you need a predefined order use a sequence or an OrderedDict.

Example 1: registering and running a PowerSupply inheriting from `Device`:

```
from PyTango.server import Device, DeviceMeta, run

class PowerSupply(Device):
    __metaclass__ = DeviceMeta

run((PowerSupply,))
```

Example 2: registering and running a MyServer defined by tango classes *MyServerClass* and *MyServer*:

```
from PyTango import Device_4Impl, DeviceClass
from PyTango.server import run

class MyServer(Device_4Impl):
    pass

class MyServerClass(DeviceClass):
    pass

run({'MyServer': (MyServerClass, MyServer)})
```

Example 3: registering and running a MyServer defined by tango classes *MyServerClass* and *MyServer*:

```
from PyTango import Device_4Impl, DeviceClass
from PyTango.server import Device, DeviceMeta, run

class PowerSupply(Device):
    __metaclass__ = DeviceMeta

class MyServer(Device_4Impl):
    pass

class MyServerClass(DeviceClass):
    pass

run([PowerSupply, [MyServerClass, MyServer]])
# or: run({'MyServer': (MyServerClass, MyServer)})
```

Parameters

- **`classes`** (*sequence or dict*) – a sequence of `Device` classes or a dictionary where keyword is the tango class name and value is a sequence of Tango Device Class python class, and Tango Device python class
- **`args`** (*list*) – list of command line arguments [default: None, meaning use sys.argv]
- **`msg_stream`** – stream where to put messages [default: sys.stdout]
- **`util`** (`Util`) – PyTango Util object [default: None meaning create a Util instance]
- **`event_loop`** (*callable*) – event_loop callable

- **post_init_callback** (*callable or tuple (see description above)*) – an optional callback that is executed between the calls Util.server_init and Util.server_run

Returns The Util singleton object

Return type `Util`

New in version 8.1.2.

Changed in version 8.1.4: when classes argument is a sequence, the items can also be a sequence <TangoClass, TangoClassClass>[, tango class name]

`PyTango.server.`**`server_run`**(*classes, args=None, msg_stream=<open file '<stdout>', mode 'w' at 0x7f71b2ae91e0>, verbose=False, util=None, event_loop=None, post_init_callback=None, green_mode=None*)

Since PyTango 8.1.2 it is just an alias to `run()`. Use `run()` instead.

New in version 8.0.0.

Changed in version 8.0.3: Added *util* keyword parameter. Returns util object

Changed in version 8.1.1: Changed default msg_stream from *stderr* to *stdout* Added *event_loop* keyword parameter. Returns util object

Changed in version 8.1.2: Added *post_init_callback* keyword parameter

Deprecated since version 8.1.2: Use `run()` instead.

5.3.2 Device

DeviceImpl

class `PyTango.`**`DeviceImpl`**

Base class for all TANGO device. This class inherits from CORBA classes where all the network layer is implemented.

`add_attribute`(*self, attr, r_meth=None, w_meth=None, is_allo_meth=None*) → Attr

Add a new attribute to the device attribute list. Please, note that if you add an attribute to a device at device creation time, this attribute will be added to the device class attribute list. Therefore, all devices belonging to the same class created after this attribute addition will also have this attribute.

Parameters

attr (Attr or AttrData) the new attribute to be added to the list.

r_meth (`callable`) the read method to be called on a read request

w_meth (`callable`) the write method to be called on a write request (if attr is writable)

is_allo_meth (`callable`) the method that is called to check if it is possible to access the attribute or not

Return (`Attr`) the newly created attribute.

Throws `DevFailed`

`append_status`(*self, status, new_line=False*) → None

Appends a string to the device status.

Parameters status : (str) the string to be appened to the device status new_line : (bool) If true, appends a new line character before the string. Default is False

Return None

check_command_exists(*self*) → None

This method check that a command is supported by the device and does not need input value. The method throws an exception if the command is not defined or needs an input value

Parameters

cmd_name (str) the command name

Return None

Throws DevFailed API_IncompatibleCmdArgumentType, API_CommandNotFound

New in PyTango 7.1.2

debug_stream(*self*, *msg*, **args*) → None

Sends the given message to the tango debug stream.

Since PyTango 7.1.3, the same can be achieved with:

```
print(msg, file=self.log_debug)
```

Parameters

msg (str) the message to be sent to the debug stream

Return None

dev_state(*self*) → DevState

Get device state. Default method to get device state. The behaviour of this method depends on the device state. If the device state is ON or ALARM, it reads the attribute(s) with an alarm level defined, check if the read value is above/below the alarm and eventually change the state to ALARM, return the device state. For all th other device state, this method simply returns the state This method can be redefined in sub-classes in case of the default behaviour does not fullfill the needs.

Parameters None

Return (DevState) the device state

Throws DevFailed - If it is necessary to read attribute(s) and a problem occurs during the reading

dev_status(*self*) → str

Get device status. Default method to get device status. It returns the contents of the device dev_status field. If the device state is ALARM, alarm messages are added to the device status. This method can be redefined in sub-classes in case of the default behaviour does not fullfill the needs.

Parameters None

Return (str) the device status

Throws DevFailed - If it is necessary to read attribute(s) and a problem occurs during the reading

error_stream(*self*, *msg*, **args*) → None

Sends the given message to the tango error stream.

Since PyTango 7.1.3, the same can be achieved with:

```
print(msg, file=self.log_error)
```

Parameters

msg (str) the message to be sent to the error stream

Return None

fatal_stream(*self, msg, *args*) → None

Sends the given message to the tango fatal stream.

Since PyTango 7.1.3, the same can be achieved with:

```
print(msg, file=self.log_fatal)
```

Parameters

msg (str) the message to be sent to the fatal stream

Return None

get_attr_min_poll_period(*self*) → seq<str>

Returns the min attribute poll period

Parameters None

Return (seq) the min attribute poll period

New in PyTango 7.2.0

get_attr_poll_ring_depth(*self, attr_name*) → int

Returns the attribute poll ring depth

Parameters

attr_name (str) the attribute name

Return (int) the attribute poll ring depth

New in PyTango 7.1.2

get_attribute_poll_period(*self, attr_name*) → int

Returns the attribute polling period (ms) or 0 if the attribute is not polled.

Parameters

attr_name (str) attribute name

Return (int) attribute polling period (ms) or 0 if it is not polled

New in PyTango 8.0.0

get_cmd_min_poll_period(*self*) → seq<str>

Returns the min command poll period

Parameters None

Return (`seq`) the min command poll period

New in PyTango 7.2.0

`get_cmd_poll_ring_depth`(*self, cmd_name*) → int

Returns the command poll ring depth

Parameters

cmd_name (`str`) the command name

Return (`int`) the command poll ring depth

New in PyTango 7.1.2

`get_command_poll_period`(*self, cmd_name*) → int

Returns the command polling period (ms) or 0 if the command is not polled.

Parameters

cmd_name (`str`) command name

Return (`int`) command polling period (ms) or 0 if it is not polled

New in PyTango 8.0.0

`get_dev_idl_version`(*self*) → int

Returns the IDL version

Parameters None

Return (`int`) the IDL version

New in PyTango 7.1.2

`get_device_attr`(*self*) → MultiAttribute

Get device multi attribute object.

Parameters None

Return (`MultiAttribute`) the device's MultiAttribute object

`get_device_properties`(*self, ds_class = None*) → None

Utility method that fetches all the device properties from the database and converts them into members of this DeviceImpl.

Parameters

ds_class (`DeviceClass`) the DeviceClass object. Optional. Default value is None meaning that the corresponding DeviceClass object for this DeviceImpl will be used

Return None

Throws `DevFailed`

`get_exported_flag`(*self*) → bool

Returns the state of the exported flag

Parameters None

Return (`bool`) the state of the exported flag

New in PyTango 7.1.2

get_logger(*self*) → Logger

Returns the Logger object for this device

Parameters None

Return (`Logger`) the Logger object for this device

get_min_poll_period(*self*) → int

Returns the min poll period

Parameters None

Return (`int`) the min poll period

New in PyTango 7.2.0

get_name(*self) -> (str*)

Get a COPY of the device name.

Parameters None

Return (`str`) the device name

get_non_auto_polled_attr(*self*) → sequence<str>

Returns a COPY of the list of non automatic polled attributes

Parameters None

Return (sequence<`str`>) a COPY of the list of non automatic polled attributes

New in PyTango 7.1.2

get_non_auto_polled_cmd(*self*) → sequence<str>

Returns a COPY of the list of non automatic polled commands

Parameters None

Return (sequence<`str`>) a COPY of the list of non automatic polled commands

New in PyTango 7.1.2

get_poll_old_factor(*self*) → int

Returns the poll old factor

Parameters None

Return (`int`) the poll old factor

New in PyTango 7.1.2

get_poll_ring_depth(*self*) → int

Returns the poll ring depth

Parameters None

Return (`int`) the poll ring depth

New in PyTango 7.1.2

get_polled_attr(*self*) → sequence<str>

Returns a COPY of the list of polled attributes

Parameters None

Return (sequence<str>) a COPY of the list of polled attributes

New in PyTango 7.1.2

get_polled_cmd(*self*) → sequence<str>

Returns a COPY of the list of polled commands

Parameters None

Return (sequence<str>) a COPY of the list of polled commands

New in PyTango 7.1.2

get_prev_state(*self*) → DevState

Get a COPY of the device's previous state.

Parameters None

Return (DevState) the device's previous state

get_state(*self*) → DevState

Get a COPY of the device state.

Parameters None

Return (DevState) Current device state

get_status(*self*) → str

Get a COPY of the device status.

Parameters None

Return (str) the device status

info_stream(*self, msg, *args*) → None

Sends the given message to the tango info stream.

Since PyTango 7.1.3, the same can be achieved with:

```
print(msg, file=self.log_info)
```

Parameters

msg (str) the message to be sent to the info stream

Return None

init_device(*self*) → None

Intialise a device.

Parameters None

Return None

is_device_locked(*self*) → bool

Returns if this device is locked by a client

Parameters None

Return (`bool`) True if it is locked or False otherwise

New in PyTango 7.1.2

is_polled(*self*) → bool

Returns if it is polled

Parameters None

Return (`bool`) True if it is polled or False otherwise

New in PyTango 7.1.2

push_archive_event(*self, attr_name*) → None

push_archive_event *(self, attr_name, except)* **->** `None`

push_archive_event *(self, attr_name, data, dim_x = 1, dim_y = 0)* **->** `None`

push_archive_event *(self, attr_name, str_data, data)* **->** `None`

push_archive_event *(self, attr_name, data, time_stamp, quality, dim_x = 1, dim_y = 0)* **->** `None`

push_archive_event *(self, attr_name, str_data, data, time_stamp, quality)* **->** `None`

Push an archive event for the given attribute name. The event is pushed to the notification daemon.

Parameters

attr_name (`str`) attribute name

data the data to be sent as attribute event data. Data must be compatible with the attribute type and format. for SPECTRUM and IMAGE attributes, data can be any type of sequence of elements compatible with the attribute type

str_data (`str`) special variation for DevEncoded data type. In this case 'data' must be a str or an object with the buffer interface.

except (`DevFailed`) Instead of data, you may want to send an exception.

dim_x (`int`) the attribute x length. Default value is 1

dim_y (`int`) the attribute y length. Default value is 0

time_stamp (`double`) the time stamp

quality (`AttrQuality`) the attribute quality factor

Throws `DevFailed` If the attribute data type is not coherent.

push_att_conf_event(*self, attr*) → None

Push an attribute configuration event.

Parameters (Attribute) the attribute for which the configuration event will be sent.

Return None

New in PyTango 7.2.1

push_change_event (*self, attr_name*) → None

push_change_event *(self, attr_name, except)* **->** `None`

push_change_event *(self, attr_name, data, dim_x = 1, dim_y = 0)* **->** `None`

push_change_event *(self, attr_name, str_data, data)* **->** `None`

push_change_event *(self, attr_name, data, time_stamp, quality, dim_x = 1, dim_y = 0)* **->** `None`

push_change_event *(self, attr_name, str_data, data, time_stamp, quality)* **->** `None`

Push a change event for the given attribute name. The event is pushed to the notification daemon.

Parameters

attr_name (`str`) attribute name

data the data to be sent as attribute event data. Data must be compatible with the attribute type and format. for SPECTRUM and IMAGE attributes, data can be any type of sequence of elements compatible with the attribute type

str_data (`str`) special variation for DevEncoded data type. In this case 'data' must be a str or an object with the buffer interface.

except (`DevFailed`) Instead of data, you may want to send an exception.

dim_x (`int`) the attribute x length. Default value is 1

dim_y (`int`) the attribute y length. Default value is 0

time_stamp (`double`) the time stamp

quality (`AttrQuality`) the attribute quality factor

Throws `DevFailed` If the attribute data type is not coherent.

push_data_ready_event (*self, attr_name, counter = 0*) → None

Push a data ready event for the given attribute name. The event is pushed to the notification daemon.

The method needs only the attribue name and an optional "counter" which will be passed unchanged within the event

Parameters

attr_name (`str`) attribute name

counter (`int`) the user counter

Return None

Throws `DevFailed` If the attribute name is unknown.

push_event (*self, attr_name, filt_names, filt_vals*) → None

push_event *(self, attr_name, filt_names, filt_vals, data, dim_x = 1, dim_y = 0)* **->** `None`

push_event *(self, attr_name, filt_names, filt_vals, str_data, data)* **->** `None`

push_event *(self, attr_name, filt_names, filt_vals, data, time_stamp, quality, dim_x = 1, dim_y = 0)* **->** `None`

push_event *(self, attr_name, filt_names, filt_vals, str_data, data, time_stamp, quality)* **->** `None`

Push a user event for the given attribute name. The event is pushed to the notification daemon.

Parameters

attr_name (`str`) attribute name

filt_names (sequence<`str`>) the filterable fields name

filt_vals (sequence<`double`>) the filterable fields value

data the data to be sent as attribute event data. Data must be compatible with the attribute type and format. for SPECTRUM and IMAGE attributes, data can be any type of sequence of elements compatible with the attribute type

str_data (`str`) special variation for DevEncoded data type. In this case 'data' must be a str or an object with the buffer interface.

dim_x (`int`) the attribute x length. Default value is 1

dim_y (`int`) the attribute y length. Default value is 0

time_stamp (`double`) the time stamp

quality (`AttrQuality`) the attribute quality factor

Throws `DevFailed` If the attribute data type is not coherent.

`register_signal`(*self*, *signo*) → None

Register a signal. Register this device as device to be informed when signal signo is sent to to the device server process

Parameters

signo (`int`) signal identifier

Return None

`remove_attribute`(*self*, *attr_name*) → None

Remove one attribute from the device attribute list.

Parameters

attr_name (`str`) attribute name

Return None

Throws `DevFailed`

`set_archive_event`(*self*, *attr_name*, *implemented*, *detect=True*) → None

Set an implemented flag for the attribute to indicate that the server fires archive events manually, without the polling to be started. If the detect parameter is set to true, the criteria specified for the archive event are verified and the event is only pushed if they are fullfilled. If detect is set to false the event is fired without any value checking!

Parameters

attr_name (`str`) attribute name

implemented (`bool`) True when the server fires change events manually.

detect (`bool`) Triggers the verification of the change event properties when set to true. Default value is true.

Return None

`set_change_event` (*self*, *attr_name*, *implemented*, *detect=True*) → None

Set an implemented flag for the attribute to indicate that the server fires change events manually, without the polling to be started. If the detect parameter is set to true, the criteria specified for the change event are verified and the event is only pushed if they are fullfilled. If detect is set to false the event is fired without any value checking!

Parameters

attr_name (`str`) attribute name

implemented (`bool`) True when the server fires change events manually.

detect (`bool`) Triggers the verification of the change event properties when set to true. Default value is true.

Return None

`set_state` (*self*, *new_state*) → None

Set device state.

Parameters

new_state (`DevState`) the new device state

Return None

`set_status` (*self*, *new_status*) → None

Set device status.

Parameters

new_status (`str`) the new device status

Return None

`stop_polling` (*self*) → None

stop_polling *(self, with_db_upd)* **->** `None`

Stop all polling for a device. if the device is polled, call this method before deleting it.

Parameters

with_db_upd (`bool`) Is it necessary to update db ?

Return None

New in PyTango 7.1.2

`unregister_signal` (*self*, *signo*) → None

Unregister a signal. Unregister this device as device to be informed when signal signo is sent to to the device server process

Parameters

signo (`int`) signal identifier

Return None

warn_stream(*self*, *msg*, **args*) → None

Sends the given message to the tango warn stream.

Since PyTango 7.1.3, the same can be achieved with:

```
print(msg, file=self.log_warn)
```

Parameters

msg (str) the message to be sent to the warn stream

Return None

Device_2Impl

class PyTango.**Device_2Impl**

Bases: PyTango._PyTango.DeviceImpl

add_attribute(*self*, *attr*, *r_meth=None*, *w_meth=None*, *is_allo_meth=None*) → Attr

Add a new attribute to the device attribute list. Please, note that if you add an attribute to a device at device creation time, this attribute will be added to the device class attribute list. Therefore, all devices belonging to the same class created after this attribute addition will also have this attribute.

Parameters

attr (Attr or AttrData) the new attribute to be added to the list.

r_meth (callable) the read method to be called on a read request

w_meth (callable) the write method to be called on a write request (if attr is writable)

is_allo_meth (callable) the method that is called to check if it is possible to access the attribute or not

Return (Attr) the newly created attribute.

Throws DevFailed

append_status(*self*, *status*, *new_line=False*) → None

Appends a string to the device status.

Parameters status : (str) the string to be appened to the device status new_line : (bool) If true, appends a new line character before the string. Default is False

Return None

check_command_exists(*self*) → None

This method check that a command is supported by the device and does not need input value. The method throws an exception if the command is not defined or needs an input value

Parameters

cmd_name (str) the command name

Return None

Throws `DevFailed` API_IncompatibleCmdArgumentType, API_CommandNotFound

New in PyTango 7.1.2

`debug_stream`(*self*, *msg*, **args*) → None

Sends the given message to the tango debug stream.

Since PyTango 7.1.3, the same can be achieved with:

```
print(msg, file=self.log_debug)
```

Parameters

msg (`str`) the message to be sent to the debug stream

Return None

`dev_state`(*self*) → DevState

Get device state. Default method to get device state. The behaviour of this method depends on the device state. If the device state is ON or ALARM, it reads the attribute(s) with an alarm level defined, check if the read value is above/below the alarm and eventually change the state to ALARM, return the device state. For all th other device state, this method simply returns the state This method can be redefined in sub-classes in case of the default behaviour does not fullfill the needs.

Parameters None

Return (`DevState`) the device state

Throws `DevFailed` - If it is necessary to read attribute(s) and a problem occurs during the reading

`dev_status`(*self*) → str

Get device status. Default method to get device status. It returns the contents of the device dev_status field. If the device state is ALARM, alarm messages are added to the device status. This method can be redefined in sub-classes in case of the default behaviour does not fullfill the needs.

Parameters None

Return (`str`) the device status

Throws `DevFailed` - If it is necessary to read attribute(s) and a problem occurs during the reading

`error_stream`(*self*, *msg*, **args*) → None

Sends the given message to the tango error stream.

Since PyTango 7.1.3, the same can be achieved with:

```
print(msg, file=self.log_error)
```

Parameters

msg (`str`) the message to be sent to the error stream

Return None

`fatal_stream`(*self*, *msg*, **args*) → None

Sends the given message to the tango fatal stream.

Since PyTango 7.1.3, the same can be achieved with:

```
print(msg, file=self.log_fatal)
```

Parameters

msg (`str`) the message to be sent to the fatal stream

Return None

`get_attr_min_poll_period`(*self*) → seq<str>

Returns the min attribute poll period

Parameters None

Return (`seq`) the min attribute poll period

New in PyTango 7.2.0

`get_attr_poll_ring_depth`(*self*, *attr_name*) → int

Returns the attribute poll ring depth

Parameters

attr_name (`str`) the attribute name

Return (`int`) the attribute poll ring depth

New in PyTango 7.1.2

`get_attribute_poll_period`(*self*, *attr_name*) → int

Returns the attribute polling period (ms) or 0 if the attribute is not polled.

Parameters

attr_name (`str`) attribute name

Return (`int`) attribute polling period (ms) or 0 if it is not polled

New in PyTango 8.0.0

`get_cmd_min_poll_period`(*self*) → seq<str>

Returns the min command poll period

Parameters None

Return (`seq`) the min command poll period

New in PyTango 7.2.0

`get_cmd_poll_ring_depth`(*self*, *cmd_name*) → int

Returns the command poll ring depth

Parameters

cmd_name (`str`) the command name

Return (`int`) the command poll ring depth

New in PyTango 7.1.2

get_command_poll_period(*self*, *cmd_name*) → int

Returns the command polling period (ms) or 0 if the command is not polled.

Parameters

cmd_name (`str`) command name

Return (`int`) command polling period (ms) or 0 if it is not polled

New in PyTango 8.0.0

get_dev_idl_version(*self*) → int

Returns the IDL version

Parameters None

Return (`int`) the IDL version

New in PyTango 7.1.2

get_device_attr(*self*) → MultiAttribute

Get device multi attribute object.

Parameters None

Return (`MultiAttribute`) the device's MultiAttribute object

get_device_properties(*self*, *ds_class = None*) → None

Utility method that fetches all the device properties from the database and converts them into members of this DeviceImpl.

Parameters

ds_class (`DeviceClass`) the DeviceClass object. Optional. Default value is None meaning that the corresponding DeviceClass object for this DeviceImpl will be used

Return None

Throws `DevFailed`

get_exported_flag(*self*) → bool

Returns the state of the exported flag

Parameters None

Return (`bool`) the state of the exported flag

New in PyTango 7.1.2

get_logger(*self*) → Logger

Returns the Logger object for this device

Parameters None

Return (`Logger`) the Logger object for this device

get_min_poll_period(*self*) → int

Returns the min poll period

Parameters None

Return (`int`) the min poll period

New in PyTango 7.2.0

`get_name`(*self) -> (str*)

Get a COPY of the device name.

Parameters None

Return (`str`) the device name

`get_non_auto_polled_attr`(*self*) → sequence<str>

Returns a COPY of the list of non automatic polled attributes

Parameters None

Return (sequence<`str`>) a COPY of the list of non automatic polled attributes

New in PyTango 7.1.2

`get_non_auto_polled_cmd`(*self*) → sequence<str>

Returns a COPY of the list of non automatic polled commands

Parameters None

Return (sequence<`str`>) a COPY of the list of non automatic polled commands

New in PyTango 7.1.2

`get_poll_old_factor`(*self*) → int

Returns the poll old factor

Parameters None

Return (`int`) the poll old factor

New in PyTango 7.1.2

`get_poll_ring_depth`(*self*) → int

Returns the poll ring depth

Parameters None

Return (`int`) the poll ring depth

New in PyTango 7.1.2

`get_polled_attr`(*self*) → sequence<str>

Returns a COPY of the list of polled attributes

Parameters None

Return (sequence<`str`>) a COPY of the list of polled attributes

New in PyTango 7.1.2

`get_polled_cmd`(*self*) → sequence<str>

Returns a COPY of the list of polled commands

Parameters None

Return (sequence<`str`>) a COPY of the list of polled commands

New in PyTango 7.1.2

`get_prev_state`(*self*) → DevState

Get a COPY of the device's previous state.

Parameters None

Return (`DevState`) the device's previous state

`get_state`(*self*) → DevState

Get a COPY of the device state.

Parameters None

Return (`DevState`) Current device state

`get_status`(*self*) → str

Get a COPY of the device status.

Parameters None

Return (`str`) the device status

`info_stream`(*self, msg, *args*) → None

Sends the given message to the tango info stream.

Since PyTango 7.1.3, the same can be achieved with:

```
print(msg, file=self.log_info)
```

Parameters

msg (`str`) the message to be sent to the info stream

Return None

`init_device`(*self*) → None

Intialise a device.

Parameters None

Return None

`is_device_locked`(*self*) → bool

Returns if this device is locked by a client

Parameters None

Return (`bool`) True if it is locked or False otherwise

New in PyTango 7.1.2

`is_polled`(*self*) → bool

Returns if it is polled

Parameters None

Return (`bool`) True if it is polled or False otherwise

New in PyTango 7.1.2

`push_archive_event` (*self, attr_name*) → None

push_archive_event *(self, attr_name, except)* **->** `None`

push_archive_event *(self, attr_name, data, dim_x = 1, dim_y = 0)* **->** `None`

push_archive_event *(self, attr_name, str_data, data)* **->** `None`

push_archive_event *(self, attr_name, data, time_stamp, quality, dim_x = 1, dim_y = 0)* **->** `None`

push_archive_event *(self, attr_name, str_data, data, time_stamp, quality)* **->** `None`

Push an archive event for the given attribute name. The event is pushed to the notification daemon.

Parameters

- **attr_name** (`str`) attribute name
- **data** the data to be sent as attribute event data. Data must be compatible with the attribute type and format. for SPECTRUM and IMAGE attributes, data can be any type of sequence of elements compatible with the attribute type
- **str_data** (`str`) special variation for DevEncoded data type. In this case 'data' must be a str or an object with the buffer interface.
- **except** (`DevFailed`) Instead of data, you may want to send an exception.
- **dim_x** (`int`) the attribute x length. Default value is 1
- **dim_y** (`int`) the attribute y length. Default value is 0
- **time_stamp** (`double`) the time stamp
- **quality** (`AttrQuality`) the attribute quality factor

Throws `DevFailed` If the attribute data type is not coherent.

`push_att_conf_event` (*self, attr*) → None

Push an attribute configuration event.

Parameters (Attribute) the attribute for which the configuration event will be sent.

Return None

New in PyTango 7.2.1

`push_change_event` (*self, attr_name*) → None

push_change_event *(self, attr_name, except)* **->** `None`

push_change_event *(self, attr_name, data, dim_x = 1, dim_y = 0)* **->** `None`

push_change_event *(self, attr_name, str_data, data)* **->** `None`

push_change_event *(self, attr_name, data, time_stamp, quality, dim_x = 1, dim_y = 0)* **->** `None`

push_change_event *(self, attr_name, str_data, data, time_stamp, quality)* **->** `None`

Push a change event for the given attribute name. The event is pushed to the notification daemon.

Parameters

attr_name (`str`) attribute name

data the data to be sent as attribute event data. Data must be compatible with the attribute type and format. for SPECTRUM and IMAGE attributes, data can be any type of sequence of elements compatible with the attribute type

str_data (`str`) special variation for DevEncoded data type. In this case 'data' must be a str or an object with the buffer interface.

except (`DevFailed`) Instead of data, you may want to send an exception.

dim_x (`int`) the attribute x length. Default value is 1

dim_y (`int`) the attribute y length. Default value is 0

time_stamp (`double`) the time stamp

quality (`AttrQuality`) the attribute quality factor

Throws `DevFailed` If the attribute data type is not coherent.

`push_data_ready_event` (*self*, *attr_name*, *counter = 0*) → None

Push a data ready event for the given attribute name. The event is pushed to the notification daemon.

The method needs only the attribue name and an optional "counter" which will be passed unchanged within the event

Parameters

attr_name (`str`) attribute name

counter (`int`) the user counter

Return None

Throws `DevFailed` If the attribute name is unknown.

`push_event` (*self*, *attr_name*, *filt_names*, *filt_vals*) → None

push_event *(self, attr_name, filt_names, filt_vals, data, dim_x = 1, dim_y = 0)* **->** `None`

push_event *(self, attr_name, filt_names, filt_vals, str_data, data)* **->** `None`

push_event *(self, attr_name, filt_names, filt_vals, data, time_stamp, quality, dim_x = 1, dim_y = 0)* **->** `None`

push_event *(self, attr_name, filt_names, filt_vals, str_data, data, time_stamp, quality)* **->** `None`

Push a user event for the given attribute name. The event is pushed to the notification daemon.

Parameters

attr_name (`str`) attribute name

filt_names (sequence<`str`>) the filterable fields name

filt_vals (sequence<`double`>) the filterable fields value

data the data to be sent as attribute event data. Data must be compatible with the attribute type and format. for SPECTRUM and IMAGE attributes, data can be any type of sequence of elements compatible with the attribute type

str_data (`str`) special variation for DevEncoded data type. In this case 'data' must be a str or an object with the buffer interface.

dim_x (`int`) the attribute x length. Default value is 1

dim_y (`int`) the attribute y length. Default value is 0

time_stamp (`double`) the time stamp

quality (`AttrQuality`) the attribute quality factor

Throws `DevFailed` If the attribute data type is not coherent.

`register_signal`(*self*, *signo*) → None

Register a signal. Register this device as device to be informed when signal signo is sent to to the device server process

Parameters

signo (`int`) signal identifier

Return None

`remove_attribute`(*self*, *attr_name*) → None

Remove one attribute from the device attribute list.

Parameters

attr_name (`str`) attribute name

Return None

Throws `DevFailed`

`set_archive_event`(*self*, *attr_name*, *implemented*, *detect=True*) → None

Set an implemented flag for the attribute to indicate that the server fires archive events manually, without the polling to be started. If the detect parameter is set to true, the criteria specified for the archive event are verified and the event is only pushed if they are fullfilled. If detect is set to false the event is fired without any value checking!

Parameters

attr_name (`str`) attribute name

implemented (`bool`) True when the server fires change events manually.

detect (`bool`) Triggers the verification of the change event properties when set to true. Default value is true.

Return None

`set_change_event`(*self*, *attr_name*, *implemented*, *detect=True*) → None

Set an implemented flag for the attribute to indicate that the server fires change events manually, without the polling to be started. If the detect parameter is set to true, the criteria specified for the change event are verified and the event is only pushed if they are fullfilled. If detect is set to false the event is fired without any value checking!

Parameters

attr_name (`str`) attribute name

implemented (`bool`) True when the server fires change events manually.

detect (`bool`) Triggers the verification of the change event properties when set to true. Default value is true.

Return None

`set_state`(*self*, *new_state*) → None

Set device state.

Parameters

new_state (`DevState`) the new device state

Return None

`set_status`(*self*, *new_status*) → None

Set device status.

Parameters

new_status (`str`) the new device status

Return None

`stop_polling`(*self*) → None
stop_polling *(self, with_db_upd)* **->** `None`

Stop all polling for a device. if the device is polled, call this method before deleting it.

Parameters

with_db_upd (`bool`) Is it necessary to update db ?

Return None

New in PyTango 7.1.2

`unregister_signal`(*self*, *signo*) → None

Unregister a signal. Unregister this device as device to be informed when signal signo is sent to to the device server process

Parameters

signo (`int`) signal identifier

Return None

`warn_stream`(*self*, *msg*, **args*) → None

Sends the given message to the tango warn stream.

Since PyTango 7.1.3, the same can be achieved with:

```
print(msg, file=self.log_warn)
```

Parameters

msg (`str`) the message to be sent to the warn stream

Return None

Device_3Impl

class `PyTango.`**`Device_3Impl`**

Bases: `PyTango._PyTango.Device_2Impl`

`add_attribute`(*self*, *attr*, *r_meth=None*, *w_meth=None*, *is_allo_meth=None*) → Attr

Add a new attribute to the device attribute list. Please, note that if you add an attribute to a device at device creation time, this attribute will be added to the device class attribute list. Therefore, all devices belonging to the same class created after this attribute addition will also have this attribute.

Parameters

attr (Attr or AttrData) the new attribute to be added to the list.

r_meth (`callable`) the read method to be called on a read request

w_meth (`callable`) the write method to be called on a write request (if attr is writable)

is_allo_meth (`callable`) the method that is called to check if it is possible to access the attribute or not

Return (`Attr`) the newly created attribute.

Throws `DevFailed`

`always_executed_hook`(*self*) → None

Hook method. Default method to implement an action necessary on a device before any command is executed. This method can be redefined in sub-classes in case of the default behaviour does not fullfill the needs

Parameters None

Return None

Throws `DevFailed` This method does not throw `exception` but a redefined method can.

`append_status`(*self*, *status*, *new_line=False*) → None

Appends a string to the device status.

Parameters status : (str) the string to be appened to the device status new_line : (bool) If true, appends a new line character before the string. Default is False

Return None

`check_command_exists`(*self*) → None

This method check that a command is supported by the device and does not need input value. The method throws an exception if the command is not defined or needs an input value

Parameters

cmd_name (`str`) the command name

Return None

Throws `DevFailed` API_IncompatibleCmdArgumentType, API_CommandNotFound

New in PyTango 7.1.2

`debug_stream`(*self*, *msg*, **args*) → None

Sends the given message to the tango debug stream.

Since PyTango 7.1.3, the same can be achieved with:

```
print(msg, file=self.log_debug)
```

Parameters

msg (`str`) the message to be sent to the debug stream

Return None

`dev_state`(*self*) → DevState

Get device state. Default method to get device state. The behaviour of this method depends on the device state. If the device state is ON or ALARM, it reads the attribute(s) with an alarm level defined, check if the read value is above/below the alarm and eventually change the state to ALARM, return the device state. For all th other device state, this method simply returns the state This method can be redefined in sub-classes in case of the default behaviour does not fullfill the needs.

Parameters None

Return (`DevState`) the device state

Throws `DevFailed` - If it is necessary to read attribute(s) and a problem occurs during the reading

`dev_status`(*self*) → str

Get device status. Default method to get device status. It returns the contents of the device dev_status field. If the device state is ALARM, alarm messages are added to the device status. This method can be redefined in sub-classes in case of the default behaviour does not fullfill the needs.

Parameters None

Return (`str`) the device status

Throws `DevFailed` - If it is necessary to read attribute(s) and a problem occurs during the reading

`error_stream`(*self*, *msg*, **args*) → None

Sends the given message to the tango error stream.

Since PyTango 7.1.3, the same can be achieved with:

```
print(msg, file=self.log_error)
```

Parameters

msg (`str`) the message to be sent to the error stream

Return None

`fatal_stream`(*self, msg, *args*) → None

Sends the given message to the tango fatal stream.

Since PyTango 7.1.3, the same can be achieved with:

```
print(msg, file=self.log_fatal)
```

Parameters

msg (`str`) the message to be sent to the fatal stream

Return None

`get_attr_min_poll_period`(*self*) → seq<str>

Returns the min attribute poll period

Parameters None

Return (`seq`) the min attribute poll period

New in PyTango 7.2.0

`get_attr_poll_ring_depth`(*self, attr_name*) → int

Returns the attribute poll ring depth

Parameters

attr_name (`str`) the attribute name

Return (`int`) the attribute poll ring depth

New in PyTango 7.1.2

`get_attribute_poll_period`(*self, attr_name*) → int

Returns the attribute polling period (ms) or 0 if the attribute is not polled.

Parameters

attr_name (`str`) attribute name

Return (`int`) attribute polling period (ms) or 0 if it is not polled

New in PyTango 8.0.0

`get_cmd_min_poll_period`(*self*) → seq<str>

Returns the min command poll period

Parameters None

Return (`seq`) the min command poll period

New in PyTango 7.2.0

get_cmd_poll_ring_depth(*self*, *cmd_name*) → int

Returns the command poll ring depth

Parameters

cmd_name (`str`) the command name

Return (`int`) the command poll ring depth

New in PyTango 7.1.2

get_command_poll_period(*self*, *cmd_name*) → int

Returns the command polling period (ms) or 0 if the command is not polled.

Parameters

cmd_name (`str`) command name

Return (`int`) command polling period (ms) or 0 if it is not polled

New in PyTango 8.0.0

get_dev_idl_version(*self*) → int

Returns the IDL version

Parameters None

Return (`int`) the IDL version

New in PyTango 7.1.2

get_device_attr(*self*) → MultiAttribute

Get device multi attribute object.

Parameters None

Return (`MultiAttribute`) the device's MultiAttribute object

get_device_properties(*self*, *ds_class = None*) → None

Utility method that fetches all the device properties from the database and converts them into members of this DeviceImpl.

Parameters

ds_class (`DeviceClass`) the DeviceClass object. Optional. Default value is None meaning that the corresponding DeviceClass object for this DeviceImpl will be used

Return None

Throws `DevFailed`

get_exported_flag(*self*) → bool

Returns the state of the exported flag

Parameters None

Return (`bool`) the state of the exported flag

New in PyTango 7.1.2

get_logger(*self*) → Logger

Returns the Logger object for this device

Parameters None

Return (`Logger`) the Logger object for this device

`get_min_poll_period`(*self*) → int

Returns the min poll period

Parameters None

Return (`int`) the min poll period

New in PyTango 7.2.0

`get_name`(*self) -> (str*)

Get a COPY of the device name.

Parameters None

Return (`str`) the device name

`get_non_auto_polled_attr`(*self*) → sequence<str>

Returns a COPY of the list of non automatic polled attributes

Parameters None

Return (sequence<`str`>) a COPY of the list of non automatic polled attributes

New in PyTango 7.1.2

`get_non_auto_polled_cmd`(*self*) → sequence<str>

Returns a COPY of the list of non automatic polled commands

Parameters None

Return (sequence<`str`>) a COPY of the list of non automatic polled commands

New in PyTango 7.1.2

`get_poll_old_factor`(*self*) → int

Returns the poll old factor

Parameters None

Return (`int`) the poll old factor

New in PyTango 7.1.2

`get_poll_ring_depth`(*self*) → int

Returns the poll ring depth

Parameters None

Return (`int`) the poll ring depth

New in PyTango 7.1.2

`get_polled_attr`(*self*) → sequence<str>

Returns a COPY of the list of polled attributes

Parameters None

Return (sequence<str>) a COPY of the list of polled attributes

New in PyTango 7.1.2

get_polled_cmd(*self*) → sequence<str>

Returns a COPY of the list of polled commands

Parameters None

Return (sequence<str>) a COPY of the list of polled commands

New in PyTango 7.1.2

get_prev_state(*self*) → DevState

Get a COPY of the device's previous state.

Parameters None

Return (DevState) the device's previous state

get_state(*self*) → DevState

Get a COPY of the device state.

Parameters None

Return (DevState) Current device state

get_status(*self*) → str

Get a COPY of the device status.

Parameters None

Return (str) the device status

info_stream(*self, msg, *args*) → None

Sends the given message to the tango info stream.

Since PyTango 7.1.3, the same can be achieved with:

```
print(msg, file=self.log_info)
```

Parameters

msg (str) the message to be sent to the info stream

Return None

is_device_locked(*self*) → bool

Returns if this device is locked by a client

Parameters None

Return (bool) True if it is locked or False otherwise

New in PyTango 7.1.2

is_polled(*self*) → bool

Returns if it is polled

Parameters None

Return (`bool`) True if it is polled or False otherwise

New in PyTango 7.1.2

`push_archive_event` (*self, attr_name*) → None

push_archive_event *(self, attr_name, except)* **->** `None`

push_archive_event *(self, attr_name, data, dim_x = 1, dim_y = 0)* **->** `None`

push_archive_event *(self, attr_name, str_data, data)* **->** `None`

push_archive_event *(self, attr_name, data, time_stamp, quality, dim_x = 1, dim_y = 0)* **->** `None`

push_archive_event *(self, attr_name, str_data, data, time_stamp, quality)* **->** `None`

Push an archive event for the given attribute name. The event is pushed to the notification daemon.

Parameters

- **attr_name** (`str`) attribute name
- **data** the data to be sent as attribute event data. Data must be compatible with the attribute type and format. for SPECTRUM and IMAGE attributes, data can be any type of sequence of elements compatible with the attribute type
- **str_data** (`str`) special variation for DevEncoded data type. In this case 'data' must be a str or an object with the buffer interface.
- **except** (`DevFailed`) Instead of data, you may want to send an exception.
- **dim_x** (`int`) the attribute x length. Default value is 1
- **dim_y** (`int`) the attribute y length. Default value is 0
- **time_stamp** (`double`) the time stamp
- **quality** (`AttrQuality`) the attribute quality factor

Throws `DevFailed` If the attribute data type is not coherent.

`push_att_conf_event` (*self, attr*) → None

Push an attribute configuration event.

Parameters (Attribute) the attribute for which the configuration event will be sent.

Return None

New in PyTango 7.2.1

`push_change_event` (*self, attr_name*) → None

push_change_event *(self, attr_name, except)* **->** `None`

push_change_event *(self, attr_name, data, dim_x = 1, dim_y = 0)* **->** `None`

push_change_event *(self, attr_name, str_data, data)* **->** `None`

push_change_event *(self, attr_name, data, time_stamp, quality, dim_x = 1, dim_y = 0)* **->** `None`

push_change_event *(self, attr_name, str_data, data, time_stamp, quality)* **->** `None`

Push a change event for the given attribute name. The event is pushed to the notification daemon.

Parameters

attr_name (`str`) attribute name

data the data to be sent as attribute event data. Data must be compatible with the attribute type and format. for SPECTRUM and IMAGE attributes, data can be any type of sequence of elements compatible with the attribute type

str_data (`str`) special variation for DevEncoded data type. In this case 'data' must be a str or an object with the buffer interface.

except (`DevFailed`) Instead of data, you may want to send an exception.

dim_x (`int`) the attribute x length. Default value is 1

dim_y (`int`) the attribute y length. Default value is 0

time_stamp (`double`) the time stamp

quality (`AttrQuality`) the attribute quality factor

Throws `DevFailed` If the attribute data type is not coherent.

`push_data_ready_event`(*self, attr_name, counter = 0*) → None

Push a data ready event for the given attribute name. The event is pushed to the notification daemon.

The method needs only the attribue name and an optional "counter" which will be passed unchanged within the event

Parameters

attr_name (`str`) attribute name

counter (`int`) the user counter

Return None

Throws `DevFailed` If the attribute name is unknown.

`push_event`(*self, attr_name, filt_names, filt_vals*) → None

push_event *(self, attr_name, filt_names, filt_vals, data, dim_x = 1, dim_y = 0)* **->** `None`

push_event *(self, attr_name, filt_names, filt_vals, str_data, data)* **->** `None`

push_event *(self, attr_name, filt_names, filt_vals, data, time_stamp, quality, dim_x = 1, dim_y = 0)* **->** `None`

push_event *(self, attr_name, filt_names, filt_vals, str_data, data, time_stamp, quality)* **->** `None`

Push a user event for the given attribute name. The event is pushed to the notification daemon.

Parameters

attr_name (`str`) attribute name

filt_names (sequence<`str`>) the filterable fields name

filt_vals (sequence<`double`>) the filterable fields value

data the data to be sent as attribute event data. Data must be compatible with the attribute type and format. for SPECTRUM and IMAGE attributes, data can be any type of sequence of elements compatible with the attribute type

str_data (`str`) special variation for DevEncoded data type. In this case 'data' must be a str or an object with the buffer interface.

dim_x (`int`) the attribute x length. Default value is 1

dim_y (`int`) the attribute y length. Default value is 0

time_stamp (`double`) the time stamp

quality (`AttrQuality`) the attribute quality factor

Throws `DevFailed` If the attribute data type is not coherent.

`read_attr_hardware`(*self, attr_list*) → None

Read the hardware to return attribute value(s). Default method to implement an action necessary on a device to read the hardware involved in a a read attribute CORBA call. This method must be redefined in sub-classes in order to support attribute reading

Parameters

attr_list [(sequence<int>) list of indices in the device object attribute vector] of an attribute to be read.

Return None

Throws `DevFailed` This method does not throw `exception` but a redefined method can.

`register_signal`(*self, signo*) → None

Register a signal. Register this device as device to be informed when signal signo is sent to to the device server process

Parameters

signo (`int`) signal identifier

Return None

`remove_attribute`(*self, attr_name*) → None

Remove one attribute from the device attribute list.

Parameters

attr_name (`str`) attribute name

Return None

Throws `DevFailed`

`set_archive_event`(*self, attr_name, implemented, detect=True*) → None

Set an implemented flag for the attribute to indicate that the server fires archive events manually, without the polling to be started. If the detect parameter is set to true, the criteria specified for the archive event are verified and the event is only pushed if they are fullfilled. If detect is set to false the event is fired without any value checking!

Parameters

attr_name (`str`) attribute name

implemented (`bool`) True when the server fires change events manually.

detect (`bool`) Triggers the verification of the change event properties when set to true. Default value is true.

Return None

`set_change_event` (*self*, *attr_name*, *implemented*, *detect=True*) → None

Set an implemented flag for the attribute to indicate that the server fires change events manually, without the polling to be started. If the detect parameter is set to true, the criteria specified for the change event are verified and the event is only pushed if they are fullfilled. If detect is set to false the event is fired without any value checking!

Parameters

attr_name (`str`) attribute name

implemented (`bool`) True when the server fires change events manually.

detect (`bool`) Triggers the verification of the change event properties when set to true. Default value is true.

Return None

`set_state` (*self*, *new_state*) → None

Set device state.

Parameters

new_state (`DevState`) the new device state

Return None

`set_status` (*self*, *new_status*) → None

Set device status.

Parameters

new_status (`str`) the new device status

Return None

`signal_handler` (*self*, *signo*) → None

Signal handler. The method executed when the signal arrived in the device server process. This method is defined as virtual and then, can be redefined following device needs.

Parameters

signo (`int`) the signal number

Return None

Throws `DevFailed` This method does not throw `exception` but a redefined method can.

stop_polling (*self*) → None
stop_polling *(self, with_db_upd)* **->** `None`

Stop all polling for a device. if the device is polled, call this method before deleting it.

Parameters

with_db_upd (`bool`) Is it necessary to update db ?

Return None

New in PyTango 7.1.2

unregister_signal (*self, signo*) → None

Unregister a signal. Unregister this device as device to be informed when signal signo is sent to to the device server process

Parameters

signo (`int`) signal identifier

Return None

warn_stream (*self, msg, *args*) → None

Sends the given message to the tango warn stream.

Since PyTango 7.1.3, the same can be achieved with:

```
print(msg, file=self.log_warn)
```

Parameters

msg (`str`) the message to be sent to the warn stream

Return None

write_attr_hardware (*self*) → None

Write the hardware for attributes. Default method to implement an action necessary on a device to write the hardware involved in a a write attribute. This method must be redefined in sub-classes in order to support writable attribute

Parameters

attr_list [(sequence<int>) list of indices in the device object attribute vector] of an attribute to be written.

Return None

Throws `DevFailed` This method does not throw `exception` but a redefined method can.

Device_4Impl

class `PyTango.`**`Device_4Impl`**
Bases: `PyTango._PyTango.Device_3Impl`

add_attribute (*self, attr, r_meth=None, w_meth=None, is_allo_meth=None*) → Attr

Add a new attribute to the device attribute list. Please, note that if you add an attribute to a device at device creation time, this attribute will be added to the device class attribute list. Therefore, all devices belonging to the same class created after this attribute addition will also have this attribute.

Parameters

- **attr** (Attr or AttrData) the new attribute to be added to the list.
- **r_meth** (`callable`) the read method to be called on a read request
- **w_meth** (`callable`) the write method to be called on a write request (if attr is writable)
- **is_allo_meth** (`callable`) the method that is called to check if it is possible to access the attribute or not

Return (`Attr`) the newly created attribute.

Throws `DevFailed`

`always_executed_hook`(*self*) → None

Hook method. Default method to implement an action necessary on a device before any command is executed. This method can be redefined in sub-classes in case of the default behaviour does not fullfill the needs

Parameters None

Return None

Throws `DevFailed` This method does not throw `exception` but a redefined method can.

`append_status`(*self*, *status*, *new_line=False*) → None

Appends a string to the device status.

Parameters status : (str) the string to be appened to the device status new_line : (bool) If true, appends a new line character before the string. Default is False

Return None

`check_command_exists`(*self*) → None

This method check that a command is supported by the device and does not need input value. The method throws an exception if the command is not defined or needs an input value

Parameters

- **cmd_name** (`str`) the command name

Return None

Throws `DevFailed` API_IncompatibleCmdArgumentType, API_CommandNotFound

New in PyTango 7.1.2

`debug_stream`(*self*, *msg*, **args*) → None

Sends the given message to the tango debug stream.

Since PyTango 7.1.3, the same can be achieved with:

```
print(msg, file=self.log_debug)
```

Parameters

msg (`str`) the message to be sent to the debug stream

Return None

dev_state(*self*) → DevState

Get device state. Default method to get device state. The behaviour of this method depends on the device state. If the device state is ON or ALARM, it reads the attribute(s) with an alarm level defined, check if the read value is above/below the alarm and eventually change the state to ALARM, return the device state. For all th other device state, this method simply returns the state This method can be redefined in sub-classes in case of the default behaviour does not fullfill the needs.

Parameters None

Return (`DevState`) the device state

Throws `DevFailed` - If it is necessary to read attribute(s) and a problem occurs during the reading

dev_status(*self*) → str

Get device status. Default method to get device status. It returns the contents of the device dev_status field. If the device state is ALARM, alarm messages are added to the device status. This method can be redefined in sub-classes in case of the default behaviour does not fullfill the needs.

Parameters None

Return (`str`) the device status

Throws `DevFailed` - If it is necessary to read attribute(s) and a problem occurs during the reading

error_stream(*self, msg, *args*) → None

Sends the given message to the tango error stream.

Since PyTango 7.1.3, the same can be achieved with:

```
print(msg, file=self.log_error)
```

Parameters

msg (`str`) the message to be sent to the error stream

Return None

fatal_stream(*self, msg, *args*) → None

Sends the given message to the tango fatal stream.

Since PyTango 7.1.3, the same can be achieved with:

```
print(msg, file=self.log_fatal)
```

Parameters

msg (`str`) the message to be sent to the fatal stream

Return None

get_attr_min_poll_period(*self*) → seq<str>

Returns the min attribute poll period

Parameters None

Return (`seq`) the min attribute poll period

New in PyTango 7.2.0

get_attr_poll_ring_depth(*self, attr_name*) → int

Returns the attribute poll ring depth

Parameters

attr_name (`str`) the attribute name

Return (`int`) the attribute poll ring depth

New in PyTango 7.1.2

get_attribute_poll_period(*self, attr_name*) → int

Returns the attribute polling period (ms) or 0 if the attribute is not polled.

Parameters

attr_name (`str`) attribute name

Return (`int`) attribute polling period (ms) or 0 if it is not polled

New in PyTango 8.0.0

get_cmd_min_poll_period(*self*) → seq<str>

Returns the min command poll period

Parameters None

Return (`seq`) the min command poll period

New in PyTango 7.2.0

get_cmd_poll_ring_depth(*self, cmd_name*) → int

Returns the command poll ring depth

Parameters

cmd_name (`str`) the command name

Return (`int`) the command poll ring depth

New in PyTango 7.1.2

get_command_poll_period(*self, cmd_name*) → int

Returns the command polling period (ms) or 0 if the command is not polled.

Parameters

cmd_name (`str`) command name

Return (`int`) command polling period (ms) or 0 if it is not polled

New in PyTango 8.0.0

get_dev_idl_version(*self*) → int

Returns the IDL version

Parameters None

Return (`int`) the IDL version

New in PyTango 7.1.2

get_device_attr(*self*) → MultiAttribute

Get device multi attribute object.

Parameters None

Return (`MultiAttribute`) the device's MultiAttribute object

get_device_properties(*self, ds_class = None*) → None

Utility method that fetches all the device properties from the database and converts them into members of this DeviceImpl.

Parameters

ds_class (`DeviceClass`) the DeviceClass object. Optional. Default value is None meaning that the corresponding DeviceClass object for this DeviceImpl will be used

Return None

Throws `DevFailed`

get_exported_flag(*self*) → bool

Returns the state of the exported flag

Parameters None

Return (`bool`) the state of the exported flag

New in PyTango 7.1.2

get_logger(*self*) → Logger

Returns the Logger object for this device

Parameters None

Return (`Logger`) the Logger object for this device

get_min_poll_period(*self*) → int

Returns the min poll period

Parameters None

Return (`int`) the min poll period

New in PyTango 7.2.0

get_name(*self) -> (str*)

Get a COPY of the device name.

Parameters None

Return (`str`) the device name

get_non_auto_polled_attr(*self*) → sequence<str>

Returns a COPY of the list of non automatic polled attributes

Parameters None

Return (sequence<`str`>) a COPY of the list of non automatic polled attributes

New in PyTango 7.1.2

get_non_auto_polled_cmd(*self*) → sequence<str>

Returns a COPY of the list of non automatic polled commands

Parameters None

Return (sequence<`str`>) a COPY of the list of non automatic polled commands

New in PyTango 7.1.2

get_poll_old_factor(*self*) → int

Returns the poll old factor

Parameters None

Return (`int`) the poll old factor

New in PyTango 7.1.2

get_poll_ring_depth(*self*) → int

Returns the poll ring depth

Parameters None

Return (`int`) the poll ring depth

New in PyTango 7.1.2

get_polled_attr(*self*) → sequence<str>

Returns a COPY of the list of polled attributes

Parameters None

Return (sequence<`str`>) a COPY of the list of polled attributes

New in PyTango 7.1.2

get_polled_cmd(*self*) → sequence<str>

Returns a COPY of the list of polled commands

Parameters None

Return (sequence<`str`>) a COPY of the list of polled commands

New in PyTango 7.1.2

get_prev_state(*self*) → DevState

Get a COPY of the device's previous state.

Parameters None

Return (`DevState`) the device's previous state

get_state (*self*) → DevState

Get a COPY of the device state.

Parameters None

Return (`DevState`) Current device state

get_status (*self*) → str

Get a COPY of the device status.

Parameters None

Return (`str`) the device status

info_stream (*self, msg, *args*) → None

Sends the given message to the tango info stream.

Since PyTango 7.1.3, the same can be achieved with:

```
print(msg, file=self.log_info)
```

Parameters

msg (`str`) the message to be sent to the info stream

Return None

is_device_locked (*self*) → bool

Returns if this device is locked by a client

Parameters None

Return (`bool`) True if it is locked or False otherwise

New in PyTango 7.1.2

is_polled (*self*) → bool

Returns if it is polled

Parameters None

Return (`bool`) True if it is polled or False otherwise

New in PyTango 7.1.2

push_archive_event (*self, attr_name*) → None

push_archive_event *(self, attr_name, except)* **->** `None`

push_archive_event *(self, attr_name, data, dim_x = 1, dim_y = 0)* **->** `None`

push_archive_event *(self, attr_name, str_data, data)* **->** `None`

push_archive_event *(self, attr_name, data, time_stamp, quality, dim_x = 1, dim_y = 0)* **->** `None`

push_archive_event *(self, attr_name, str_data, data, time_stamp, quality)* **->** `None`

Push an archive event for the given attribute name. The event is pushed to the notification daemon.

Parameters

attr_name (`str`) attribute name

data the data to be sent as attribute event data. Data must be compatible with the attribute type and format. for SPECTRUM and IMAGE attributes, data can be any type of sequence of elements compatible with the attribute type

str_data (`str`) special variation for DevEncoded data type. In this case 'data' must be a str or an object with the buffer interface.

except (`DevFailed`) Instead of data, you may want to send an exception.

dim_x (`int`) the attribute x length. Default value is 1

dim_y (`int`) the attribute y length. Default value is 0

time_stamp (`double`) the time stamp

quality (`AttrQuality`) the attribute quality factor

Throws `DevFailed` If the attribute data type is not coherent.

`push_att_conf_event`(*self, attr*) → None

Push an attribute configuration event.

Parameters (Attribute) the attribute for which the configuration event will be sent.

Return None

New in PyTango 7.2.1

`push_change_event`(*self, attr_name*) → None

push_change_event *(self, attr_name, except)* **->** `None`

push_change_event *(self, attr_name, data, dim_x = 1, dim_y = 0)* **->** `None`

push_change_event *(self, attr_name, str_data, data)* **->** `None`

push_change_event *(self, attr_name, data, time_stamp, quality, dim_x = 1, dim_y = 0)* **->** `None`

push_change_event *(self, attr_name, str_data, data, time_stamp, quality)* **->** `None`

Push a change event for the given attribute name. The event is pushed to the notification daemon.

Parameters

attr_name (`str`) attribute name

data the data to be sent as attribute event data. Data must be compatible with the attribute type and format. for SPECTRUM and IMAGE attributes, data can be any type of sequence of elements compatible with the attribute type

str_data (`str`) special variation for DevEncoded data type. In this case 'data' must be a str or an object with the buffer interface.

except (`DevFailed`) Instead of data, you may want to send an exception.

dim_x (`int`) the attribute x length. Default value is 1

dim_y (`int`) the attribute y length. Default value is 0

time_stamp (`double`) the time stamp

quality (`AttrQuality`) the attribute quality factor

Throws `DevFailed` If the attribute data type is not coherent.

push_data_ready_event (*self, attr_name, counter = 0*) → None

Push a data ready event for the given attribute name. The event is pushed to the notification daemon.

The method needs only the attribue name and an optional "counter" which will be passed unchanged within the event

Parameters

attr_name (`str`) attribute name

counter (`int`) the user counter

Return None

Throws `DevFailed` If the attribute name is unknown.

push_event (*self, attr_name, filt_names, filt_vals*) → None

push_event *(self, attr_name, filt_names, filt_vals, data, dim_x = 1, dim_y = 0)* **->** `None`

push_event *(self, attr_name, filt_names, filt_vals, str_data, data)* **->** `None`

push_event *(self, attr_name, filt_names, filt_vals, data, time_stamp, quality, dim_x = 1, dim_y = 0)* **->** `None`

push_event *(self, attr_name, filt_names, filt_vals, str_data, data, time_stamp, quality)* **->** `None`

Push a user event for the given attribute name. The event is pushed to the notification daemon.

Parameters

attr_name (`str`) attribute name

filt_names (sequence<`str`>) the filterable fields name

filt_vals (sequence<`double`>) the filterable fields value

data the data to be sent as attribute event data. Data must be compatible with the attribute type and format. for SPECTRUM and IMAGE attributes, data can be any type of sequence of elements compatible with the attribute type

str_data (`str`) special variation for DevEncoded data type. In this case 'data' must be a str or an object with the buffer interface.

dim_x (`int`) the attribute x length. Default value is 1

dim_y (`int`) the attribute y length. Default value is 0

time_stamp (`double`) the time stamp

quality (`AttrQuality`) the attribute quality factor

Throws `DevFailed` If the attribute data type is not coherent.

read_attr_hardware (*self, attr_list*) → None

Read the hardware to return attribute value(s). Default method to implement an action necessary on a device to read the hardware involved in a a read attribute CORBA call. This method must be redefined in sub-classes in order to support attribute reading

Parameters

attr_list [(sequence<int>) list of indices in the device object attribute vector] of an attribute to be read.

Return None

Throws `DevFailed` This method does not throw `exception` but a redefined method can.

`register_signal`(*self*, *signo*) → None

Register a signal. Register this device as device to be informed when signal signo is sent to to the device server process

Parameters

signo (`int`) signal identifier

Return None

`remove_attribute`(*self*, *attr_name*) → None

Remove one attribute from the device attribute list.

Parameters

attr_name (`str`) attribute name

Return None

Throws `DevFailed`

`set_archive_event`(*self*, *attr_name*, *implemented*, *detect=True*) → None

Set an implemented flag for the attribute to indicate that the server fires archive events manually, without the polling to be started. If the detect parameter is set to true, the criteria specified for the archive event are verified and the event is only pushed if they are fullfilled. If detect is set to false the event is fired without any value checking!

Parameters

attr_name (`str`) attribute name

implemented (`bool`) True when the server fires change events manually.

detect (`bool`) Triggers the verification of the change event properties when set to true. Default value is true.

Return None

`set_change_event`(*self*, *attr_name*, *implemented*, *detect=True*) → None

Set an implemented flag for the attribute to indicate that the server fires change events manually, without the polling to be started. If the detect parameter is set to true, the criteria specified for the change event are verified and the event is only pushed if they are fullfilled. If detect is set to false the event is fired without any value checking!

Parameters

attr_name (`str`) attribute name

implemented (`bool`) True when the server fires change events manually.

detect (`bool`) Triggers the verification of the change event properties when set to true. Default value is true.

Return None

`set_state` (*self*, *new_state*) → None

Set device state.

Parameters

new_state (`DevState`) the new device state

Return None

`set_status` (*self*, *new_status*) → None

Set device status.

Parameters

new_status (`str`) the new device status

Return None

`signal_handler` (*self*, *signo*) → None

Signal handler. The method executed when the signal arrived in the device server process. This method is defined as virtual and then, can be redefined following device needs.

Parameters

signo (`int`) the signal number

Return None

Throws `DevFailed` This method does not throw `exception` but a redefined method can.

`stop_polling` (*self*) → None

stop_polling *(self, with_db_upd)* **->** `None`

Stop all polling for a device. if the device is polled, call this method before deleting it.

Parameters

with_db_upd (`bool`) Is it necessary to update db ?

Return None

New in PyTango 7.1.2

`unregister_signal` (*self*, *signo*) → None

Unregister a signal. Unregister this device as device to be informed when signal signo is sent to to the device server process

Parameters

signo (`int`) signal identifier

Return None

`warn_stream`(*self, msg, *args*) → None

Sends the given message to the tango warn stream.

Since PyTango 7.1.3, the same can be achieved with:

```
print(msg, file=self.log_warn)
```

Parameters

msg (`str`) the message to be sent to the warn stream

Return None

`write_attr_hardware`(*self*) → None

Write the hardware for attributes. Default method to implement an action necessary on a device to write the hardware involved in a a write attribute. This method must be redefined in sub-classes in order to support writable attribute

Parameters

attr_list [(sequence<int>) list of indices in the device object attribute vector] of an attribute to be written.

Return None

Throws `DevFailed` This method does not throw `exception` but a redefined method can.

DServer

class `PyTango.`**`DServer`**
Bases: `PyTango._PyTango.Device_4Impl`

5.3.3 DeviceClass

class `PyTango.`**`DeviceClass`**(*name*)
Base class for all TANGO device-class class. A TANGO device-class class is a class where is stored all data/method common to all devices of a TANGO device class

`add_wiz_class_prop`(*self, str, str*) → None
add_wiz_class_prop *(self, str, str, str)* **->** `None`

For internal usage only

Parameters None

Return None

`add_wiz_dev_prop`(*self, str, str*) → None
add_wiz_dev_prop *(self, str, str, str)* **->** `None`

For internal usage only

Parameters None

Return None

`create_device`(*self, device_name, alias=None, cb=None*) → None

Creates a new device of the given class in the database, creates a new DeviceImpl for it and calls init_device (just like it is done for existing devices when the DS starts up)

An optional parameter callback is called AFTER the device is registered in the database and BEFORE the init_device for the newly created device is called

Throws PyTango.DevFailed:

- the device name exists already or
- the given class is not registered for this DS.
- the cb is not a callable

New in PyTango 7.1.2

Parameters

device_name (`str`) the device name

alias (`str`) optional alias. Default value is None meaning do not create device alias

cb (`callable`) a callback that is called AFTER the device is registered in the database and BEFORE the init_device for the newly created device is called. Typically you may want to put device and/or attribute properties in the database here. The callback must receive a parameter: device name (str). Default value is None meaning no callback

Return None

`delete_device`(*self, klass_name, device_name*) → None

Deletes an existing device from the database and from this running server

Throws PyTango.DevFailed:

- the device name doesn't exist in the database
- the device name doesn't exist in this DS.

New in PyTango 7.1.2

Parameters

klass_name (`str`) the device class name

device_name (`str`) the device name

Return None

`device_destroyer`(*name*)
for internal usage only

`device_factory`(*device_list*)
for internal usage only

`device_name_factory`(*self, dev_name_list*) → None

Create device(s) name list (for no database device server). This method can be re-defined in DeviceClass sub-class for device server started without database. Its rule is to initialise class device name. The default method does nothing.

Parameters

dev_name_list (`seq`) sequence of devices to be filled

Return None

dyn_attr(*self, device_list*) → None

Default implementation does not do anything Overwrite in order to provide dynamic attributes

Parameters

device_list (`seq`) sequence of devices of this class

Return None

export_device(*self, dev, corba_dev_name = 'Unused'*) → None

For internal usage only

Parameters

dev (`DeviceImpl`) device object

corba_dev_name (`str`) CORBA device name. Default value is 'Unused'

Return None

get_cmd_by_name(*self, (str)cmd_name*) → PyTango.Command

Get a reference to a command object.

Parameters

cmd_name (`str`) command name

Return (`PyTango.Command`) PyTango.Command object

New in PyTango 8.0.0

get_command_list(*self*) → sequence<PyTango.Command>

Gets the list of PyTango.Command objects for this class

Parameters None

Return (sequence<`PyTango.Command`>) list of PyTango.Command objects for this class

New in PyTango 8.0.0

get_cvs_location(*self*) → None

Gets the cvs localtion

Parameters None

Return (`str`) cvs location

get_cvs_tag(*self*) → str

Gets the cvs tag

Parameters None

Return (`str`) cvs tag

get_device_list(*self*) → sequence<PyTango.DeviceImpl>

Gets the list of PyTango.DeviceImpl objects for this class

Parameters None

Return (sequence<`PyTango.DeviceImpl`>) list of PyTango.DeviceImpl objects for this class

`get_doc_url`(*self*) → str

Get the TANGO device class documentation URL.

Parameters None

Return (`str`) the TANGO device type name

`get_name`(*self*) → str

Get the TANGO device class name.

Parameters None

Return (`str`) the TANGO device class name.

`get_type`(*self*) → str

Gets the TANGO device type name.

Parameters None

Return (`str`) the TANGO device type name

`register_signal`(*self*, *signo*) → None

register_signal *(self, signo, own_handler=false)* **->** `None`

Register a signal. Register this class as class to be informed when signal signo is sent to to the device server process. The second version of the method is available only under Linux.

Throws PyTango.DevFailed:

- if the signal number is out of range
- if the operating system failed to register a signal for the process.

Parameters

signo (`int`) signal identifier

own_handler (`bool`) true if you want the device signal handler to be executed in its own handler instead of being executed by the signal thread. If this parameter is set to true, care should be taken on how the handler is written. A default false value is provided

Return None

`set_type`(*self*, *dev_type*) → None

Set the TANGO device type name.

Parameters

dev_type (`str`) the new TANGO device type name

Return None

`signal_handler`(*self*, *signo*) → None

Signal handler.

The method executed when the signal arrived in the device server process. This method is defined as virtual and then, can be redefined following device class needs.

Parameters

signo (`int`) signal identifier

Return None

`unregister_signal`(*self*, *signo*) → None

Unregister a signal. Unregister this class as class to be informed when signal signo is sent to to the device server process

Parameters

signo (`int`) signal identifier

Return None

5.3.4 Logging decorators

LogIt

class `PyTango.`**`LogIt`**(*show_args=False*, *show_kwargs=False*, *show_ret=False*)

A class designed to be a decorator of any method of a `PyTango.DeviceImpl` subclass. The idea is to log the entrance and exit of any decorated method.

Example:

```
class MyDevice(PyTango.Device_4Impl):

    @PyTango.LogIt()
    def read_Current(self, attr):
        attr.set_value(self._current, 1)
```

All log messages generated by this class have DEBUG level. If you whish to have different log level messages, you should implement subclasses that log to those levels. See, for example, `PyTango.InfoIt`.

The constructor receives three optional arguments:

- show_args - shows method arguments in log message (defaults to False)
- show_kwargs - shows keyword method arguments in log message (defaults to False)
- show_ret - shows return value in log message (defaults to False)

DebugIt

class `PyTango.`**`DebugIt`**(*show_args=False*, *show_kwargs=False*, *show_ret=False*)

A class designed to be a decorator of any method of a `PyTango.DeviceImpl` subclass. The idea is to log the entrance and exit of any decorated method as DEBUG level records.

Example:

```
class MyDevice(PyTango.Device_4Impl):

    @PyTango.DebugIt()
    def read_Current(self, attr):
        attr.set_value(self._current, 1)
```

All log messages generated by this class have DEBUG level.
The constructor receives three optional arguments:

- show_args - shows method arguments in log message (defaults to False)
- show_kwargs - shows keyword method arguments in log message (defaults to False)
- show_ret - shows return value in log message (defaults to False)

InfoIt

class `PyTango.`**`InfoIt`**(*show_args=False, show_kwargs=False, show_ret=False*)
A class designed to be a decorator of any method of a `PyTango.DeviceImpl` subclass. The idea is to log the entrance and exit of any decorated method as INFO level records.

Example:

```
class MyDevice(PyTango.Device_4Impl):

    @PyTango.InfoIt()
    def read_Current(self, attr):
        attr.set_value(self._current, 1)
```

All log messages generated by this class have INFO level.
The constructor receives three optional arguments:

- show_args - shows method arguments in log message (defaults to False)
- show_kwargs - shows keyword method arguments in log message (defaults to False)
- show_ret - shows return value in log message (defaults to False)

WarnIt

class `PyTango.`**`WarnIt`**(*show_args=False, show_kwargs=False, show_ret=False*)
A class designed to be a decorator of any method of a `PyTango.DeviceImpl` subclass. The idea is to log the entrance and exit of any decorated method as WARN level records.

Example:

```
class MyDevice(PyTango.Device_4Impl):

    @PyTango.WarnIt()
    def read_Current(self, attr):
        attr.set_value(self._current, 1)
```

All log messages generated by this class have WARN level.
The constructor receives three optional arguments:

- show_args - shows method arguments in log message (defaults to False)
- show_kwargs - shows keyword method arguments in log message (defaults to False)
- show_ret - shows return value in log message (defaults to False)

ErrorIt

class `PyTango.`**`ErrorIt`**(*show_args=False, show_kwargs=False, show_ret=False*)

A class designed to be a decorator of any method of a `PyTango.DeviceImpl` subclass. The idea is to log the entrance and exit of any decorated method as ERROR level records.

Example:

```
class MyDevice(PyTango.Device_4Impl):

    @PyTango.ErrorIt()
    def read_Current(self, attr):
        attr.set_value(self._current, 1)
```

All log messages generated by this class have ERROR level.
The constructor receives three optional arguments:

- show_args - shows method arguments in log message (defaults to False)
- show_kwargs - shows keyword method arguments in log message (defaults to False)
- show_ret - shows return value in log message (defaults to False)

FatalIt

class `PyTango.`**`FatalIt`**(*show_args=False, show_kwargs=False, show_ret=False*)

A class designed to be a decorator of any method of a `PyTango.DeviceImpl` subclass. The idea is to log the entrance and exit of any decorated method as FATAL level records.

Example:

```
class MyDevice(PyTango.Device_4Impl):

    @PyTango.FatalIt()
    def read_Current(self, attr):
        attr.set_value(self._current, 1)
```

All log messages generated by this class have FATAL level.
The constructor receives three optional arguments:

- show_args - shows method arguments in log message (defaults to False)
- show_kwargs - shows keyword method arguments in log message (defaults to False)
- show_ret - shows return value in log message (defaults to False)

5.3.5 Attribute classes

Attr

class `PyTango.`**`Attr`**

This class represents a Tango writable attribute.

`get_assoc`(*self*) → str

Get the associated name.

Parameters None

Return (`bool`) the associated name

get_cl_name(*self*) → str

Returns the class name

Parameters None

Return (`str`) the class name

New in PyTango 7.2.0

get_class_properties(*self*) → sequence<AttrProperty>

Get the class level attribute properties

Parameters None

Return (sequence<`AttrProperty`>) the class attribute properties

get_disp_level(*self*) → DispLevel

Get the attribute display level

Parameters None

Return (`DispLevel`) the attribute display level

get_format(*self*) → AttrDataFormat

Get the attribute format

Parameters None

Return (`AttrDataFormat`) the attribute format

get_memorized(*self*) → bool

Determine if the attribute is memorized or not.

Parameters None

Return (`bool`) True if the attribute is memorized

get_memorized_init(*self*) → bool

Determine if the attribute is written at startup from the memorized value if it is memorized

Parameters None

Return (`bool`) True if initialized with memorized value or not

get_name(*self*) → str

Get the attribute name.

Parameters None

Return (`str`) the attribute name

get_polling_period(*self*) → int

Get the polling period (mS)

Parameters None

Return (`int`) the polling period (mS)

get_type(*self*) → int

Get the attribute data type

Parameters None

Return (`int`) the attribute data type

get_user_default_properties(*self*) → sequence<AttrProperty>

Get the user default attribute properties

Parameters None

Return (sequence<`AttrProperty`>) the user default attribute properties

get_writable(*self*) → AttrWriteType

Get the attribute write type

Parameters None

Return (`AttrWriteType`) the attribute write type

is_archive_event(*self*) → bool

Check if the archive event is fired manually for this attribute.

Parameters None

Return (`bool`) true if a manual fire archive event is implemented.

is_assoc(*self*) → bool

Determine if it is assoc.

Parameters None

Return (`bool`) if it is assoc

is_change_event(*self*) → bool

Check if the change event is fired manually for this attribute.

Parameters None

Return (`bool`) true if a manual fire change event is implemented.

is_check_archive_criteria(*self*) → bool

Check if the archive event criteria should be checked when firing the event manually.

Parameters None

Return (`bool`) true if a archive event criteria will be checked.

is_check_change_criteria(*self*) → bool

Check if the change event criteria should be checked when firing the event manually.

Parameters None

Return (`bool`) true if a change event criteria will be checked.

`is_data_ready_event` (*self*) → bool

Check if the data ready event is fired for this attribute.

Parameters None

Return (`bool`) true if firing data ready event is implemented.

New in PyTango 7.2.0

`set_archive_event` (*self*) → None

Set a flag to indicate that the server fires archive events manually without the polling to be started for the attribute If the detect parameter is set to true, the criteria specified for the archive event are verified and the event is only pushed if they are fullfilled.

If detect is set to false the event is fired without checking!

Parameters

implemented (`bool`) True when the server fires change events manually.

detect (`bool`) Triggers the verification of the archive event properties when set to true.

Return None

`set_change_event` (*self*, *implemented*, *detect*) → None

Set a flag to indicate that the server fires change events manually without the polling to be started for the attribute. If the detect parameter is set to true, the criteria specified for the change event are verified and the event is only pushed if they are fullfilled.

If detect is set to false the event is fired without checking!

Parameters

implemented (`bool`) True when the server fires change events manually.

detect (`bool`) Triggers the verification of the change event properties when set to true.

Return None

`set_cl_name` (*self*, *cl*) → None

Sets the class name

Parameters

cl (`str`) new class name

Return None

New in PyTango 7.2.0

`set_class_properties` (*self*, *props*) → None

Set the class level attribute properties

Parameters

props (`StdAttrPropertyVector`) new class level attribute properties

Return None

`set_data_ready_event`(*self*, *implemented*) → None

Set a flag to indicate that the server fires data ready events.

Parameters

implemented (`bool`) True when the server fires data ready events

Return None

New in PyTango 7.2.0

`set_default_properties`(*self*) → None

Set default attribute properties.

Parameters

attr_prop (`UserDefaultAttrProp`) the user default property class

Return None

`set_disp_level`(*self*, *disp_lelel*) → None

Set the attribute display level.

Parameters

disp_level (`DispLevel`) the new display level

Return None

`set_memorized`(*self*) → None

Set the attribute as memorized in database (only for scalar and writable attribute) With no argument the setpoint will be written to the attribute during initialisation!

Parameters None

Return None

`set_memorized_init`(*self*, *write_on_init*) → None

Set the initialisation flag for memorized attributes true = the setpoint value will be written to the attribute on initialisation false = only the attribute setpoint is initialised. No action is taken on the attribute

Parameters

write_on_init (`bool`) if true the setpoint value will be written to the attribute on initialisation

Return None

`set_polling_period`(*self*, *period*) → None

Set the attribute polling update period.

Parameters

period (`int`) the attribute polling period (in mS)

Return None

Attribute

class `PyTango.`**`Attribute`**

This class represents a Tango attribute.

`check_alarm`(*self*) → bool

Check if the attribute read value is below/above the alarm level.

Parameters None

Return (`bool`) true if the attribute is in alarm condition.

Throws `DevFailed` If no alarm level is defined.

`get_assoc_ind`(*self*) → int

Get index of the associated writable attribute.

Parameters None

Return (`int`) the index in the main attribute vector of the associated writable attribute

`get_assoc_name`(*self*) → str

Get name of the associated writable attribute.

Parameters None

Return (`str`) the associated writable attribute name

`get_attr_serial_model`(*self*) → AttrSerialModel

Get attribute serialization model.

Parameters None

Return (`AttrSerialModel`) The attribute serialization model

New in PyTango 7.1.0

`get_data_format`(*self*) → AttrDataFormat

Get attribute data format.

Parameters None

Return (`AttrDataFormat`) the attribute data format

`get_data_size`(*self*) → None

Get attribute data size.

Parameters None

Return (`int`) the attribute data size

`get_data_type`(*self*) → int

Get attribute data type.

Parameters None

Return (`int`) the attribute data type

`get_date`(*self*) → TimeVal

Get a COPY of the attribute date.

Parameters None

Return (`TimeVal`) the attribute date

`get_label`(*self*) → str

Get attribute label property.

Parameters None

Return (`str`) he attribute label

`get_max_dim_x`(*self*) → int

Get attribute maximum data size in x dimension.

Parameters None

Return (`int`) the attribute maximum data size in x dimension. Set to 1 for scalar attribute

`get_max_dim_y`(*self*) → int

Get attribute maximum data size in y dimension.

Parameters None

Return (`int`) the attribute maximum data size in y dimension. Set to 0 for scalar attribute

`get_name`(*self*) → str

Get attribute name.

Parameters None

Return (`str`) The attribute name

`get_polling_period`(*self*) → int

Get attribute polling period.

Parameters None

Return (`int`) The attribute polling period in mS. Set to 0 when the attribute is not polled

`get_properties`(*self*, *attr_cfg = None*) → AttributeConfig

Get attribute properties.

Parameters

conf (`AttributeConfig`) the config object to be filled with the attribute configuration. Default is None meaning the method will create internally a new AttributeConfig and return it

Return (`AttributeConfig`) the config object filled with attribute configuration information

New in PyTango 7.1.4

`get_properties_2`(*self*, *attr_cfg = None*) → AttributeConfig_2

Get attribute properties.

Parameters

conf (`AttributeConfig_2`) the config object to be filled with the attribute configuration. Default is None meaning the method will create internally a new AttributeConfig and return it

Return (`AttributeConfig_2`) the config object filled with attribute configuration information

New in PyTango 7.1.4

`get_properties_3`(*self*, *attr_cfg = None*) → AttributeConfig_3

Get attribute properties.

Parameters

conf (`AttributeConfig_3`) the config object to be filled with the attribute configuration. Default is None meaning the method will create internally a new AttributeConfig and return it

Return (`AttributeConfig_3`) the config object filled with attribute configuration information

New in PyTango 7.1.4

`get_quality`(*self*) → AttrQuality

Get a COPY of the attribute data quality.

Parameters None

Return (`AttrQuality`) the attribute data quality

`get_writable`(*self*) → AttrWriteType

Get the attribute writable type (RO/WO/RW).

Parameters None

Return (`AttrWriteType`) The attribute write type.

`get_x`(*self*) → int

Get attribute data size in x dimension.

Parameters None

Return (`int`) the attribute data size in x dimension. Set to 1 for scalar attribute

`get_y`(*self*) → int

Get attribute data size in y dimension.

Parameters None

Return (`int`) the attribute data size in y dimension. Set to 1 for scalar attribute

`is_archive_event`(*self*) → bool

Check if the archive event is fired manually (without polling) for this attribute.

Parameters None

Return (`bool`) True if a manual fire archive event is implemented.

New in PyTango 7.1.0

is_change_event (*self*) → bool

Check if the change event is fired manually (without polling) for this attribute.

Parameters None

Return (bool) True if a manual fire change event is implemented.

New in PyTango 7.1.0

is_check_archive_criteria (*self*) → bool

Check if the archive event criteria should be checked when firing the event manually.

Parameters None

Return (bool) True if a archive event criteria will be checked.

New in PyTango 7.1.0

is_check_change_criteria (*self*) → bool

Check if the change event criteria should be checked when firing the event manually.

Parameters None

Return (bool) True if a change event criteria will be checked.

New in PyTango 7.1.0

is_data_ready_event (*self*) → bool

Check if the data ready event is fired manually (without polling) for this attribute.

Parameters None

Return (bool) True if a manual fire data ready event is implemented.

New in PyTango 7.2.0

is_max_alarm (*self*) → bool

Check if the attribute is in maximum alarm condition.

Parameters None

Return (bool) true if the attribute is in alarm condition (read value above the max. alarm).

is_max_warning (*self*) → bool

Check if the attribute is in maximum warning condition.

Parameters None

Return (bool) true if the attribute is in warning condition (read value above the max. warning).

is_min_alarm (*self*) → bool

Check if the attribute is in minimum alarm condition.

Parameters None

Return (`bool`) true if the attribute is in alarm condition (read value below the min. alarm).

is_min_warning(*self*) → bool

Check if the attribute is in minimum warning condition.

Parameters None

Return (`bool`) true if the attribute is in warning condition (read value below the min. warning).

is_polled(*self*) → bool

Check if the attribute is polled.

Parameters None

Return (`bool`) true if the attribute is polled.

is_rds_alarm(*self*) → bool

Check if the attribute is in RDS alarm condition.

Parameters None

Return (`bool`) true if the attribute is in RDS condition (Read Different than Set).

is_write_associated(*self*) → bool

Check if the attribute has an associated writable attribute.

Parameters None

Return (`bool`) True if there is an associated writable attribute

remove_configuration(*self*) → None

Remove the attribute configuration from the database. This method can be used to clean-up all the configuration of an attribute to come back to its default values or the remove all configuration of a dynamic attribute before deleting it.

The method removes all configured attribute properties and removes the attribute from the list of polled attributes.

Parameters None

Return None

New in PyTango 7.1.0

set_archive_event(*self, implemented, detect = True*) → None

Set a flag to indicate that the server fires archive events manually, without the polling to be started for the attribute If the detect parameter is set to true, the criteria specified for the archive event are verified and the event is only pushed if they are fullfilled.

Parameters

implemented (`bool`) True when the server fires archive events manually.

detect (`bool`) (optional, default is True) Triggers the verification of the archive event properties when set to true.

Return None

New in PyTango 7.1.0

`set_assoc_ind`(*self*, *index*) → None

Set index of the associated writable attribute.

Parameters

index (`int`) The new index in the main attribute vector of the associated writable attribute

Return None

`set_attr_serial_model`(*self*, *ser_model*) → void

Set attribute serialization model. This method allows the user to choose the attribute serialization model.

Parameters

ser_model (`AttrSerialModel`) The new serialisation model. The serialization model must be one of ATTR_BY_KERNEL, ATTR_BY_USER or ATTR_NO_SYNC

Return None

New in PyTango 7.1.0

`set_change_event`(*self*, *implemented*, *detect = True*) → None

Set a flag to indicate that the server fires change events manually, without the polling to be started for the attribute. If the detect parameter is set to true, the criteria specified for the change event are verified and the event is only pushed if they are fullfilled. If detect is set to false the event is fired without any value checking!

Parameters

implemented (`bool`) True when the server fires change events manually.

detect (`bool`) (optional, default is True) Triggers the verification of the change event properties when set to true.

Return None

New in PyTango 7.1.0

`set_data_ready_event`(*self*, *implemented*) → None

Set a flag to indicate that the server fires data ready events.

Parameters

implemented (`bool`) True when the server fires data ready events manually.

Return None

New in PyTango 7.2.0

`set_date`(*self*, *new_date*) → None

Set attribute date.

Parameters

new_date (`TimeVal`) the attribute date

Return None

`set_properties` (*self, attr_cfg, dev*) → None

Set attribute properties.

This method sets the attribute properties value with the content of the fileds in the AttributeConfig/ AttributeConfig_3 object

Parameters

conf (AttributeConfig or AttributeConfig_3) the config object.

dev (`DeviceImpl`) the device

New in PyTango 7.1.4

`set_quality` (*self, quality, send_event=False*) → None

Set attribute data quality.

Parameters

quality (`AttrQuality`) the new attribute data quality

send_event (`bool`) true if a change event should be sent. Default is false.

Return None

`set_value` (*self, data, dim_x = 1, dim_y = 0*) → None <= DEPRECATED

set_value *(self, data)* **->** `None`

set_value *(self, str_data, data)* **->** `None`

Set internal attribute value. This method stores the attribute read value inside the object. This method also stores the date when it is called and initializes the attribute quality factor.

Parameters

data the data to be set. Data must be compatible with the attribute type and format. In the DEPRECATED form for SPECTRUM and IMAGE attributes, data can be any type of FLAT sequence of elements compatible with the attribute type. In the new form (without dim_x or dim_y) data should be any sequence for SPECTRUM and a SEQUENCE of equal-lenght SEQUENCES for IMAGE attributes. The recommended sequence is a C continuous and aligned numpy array, as it can be optimized.

str_data (`str`) special variation for DevEncoded data type. In this case 'data' must be a str or an object with the buffer interface.

dim_x (`int`) [DEPRECATED] the attribute x length. Default value is 1

dim_y (`int`) [DEPRECATED] the attribute y length. Default value is 0

Return None

`set_value_date_quality`(*self, data, time_stamp, quality, dim_x = 1, dim_y = 0*) → None <= DEPRECATED

set_value_date_quality *(self, data, time_stamp, quality)* **->** `None`

set_value_date_quality *(self, str_data, data, time_stamp, quality)* **->** `None`

Set internal attribute value, date and quality factor. This method stores the attribute read value, the date and the attribute quality factor inside the object.

Parameters

data the data to be set. Data must be compatible with the attribute type and format. In the DEPRECATED form for SPECTRUM and IMAGE attributes, data can be any type of FLAT sequence of elements compatible with the attribute type. In the new form (without dim_x or dim_y) data should be any sequence for SPECTRUM and a SEQUENCE of equal-lenght SEQUENCES for IMAGE attributes. The recommended sequence is a C continuous and aligned numpy array, as it can be optimized.

str_data (`str`) special variation for DevEncoded data type. In this case 'data' must be a str or an object with the buffer interface.

dim_x (`int`) [DEPRECATED] the attribute x length. Default value is 1

dim_y (`int`) [DEPRECATED] the attribute y length. Default value is 0

time_stamp (`double`) the time stamp

quality (`AttrQuality`) the attribute quality factor

Return None

WAttribute

class `PyTango.`**`WAttribute`**

This class represents a Tango writable attribute.

`get_max_value`(*self*) → obj

Get attribute maximum value or throws an exception if the attribute does not have a maximum value.

Parameters None

Return (`obj`) an object with the python maximum value

`get_min_value`(*self*) → obj

Get attribute minimum value or throws an exception if the attribute does not have a minimum value.

Parameters None

Return (`obj`) an object with the python minimum value

get_write_value(*self, lst*) → None <= DEPRECATED
get_write_value *(self, extract_as=ExtractAs.Numpy)* **->** `obj`

Retrieve the new value for writable attribute.

Parameters

extract_as (`ExtractAs`)

lst [out] (list) a list object that will be filled with the attribute write value (DEPRECATED)

Return (`obj`) the attribute write value.

get_write_value_length(*self*) → int

Retrieve the new value length (data number) for writable attribute.

Parameters None

Return (`int`) the new value data length

is_max_value(*self*) → bool

Check if the attribute has a maximum value.

Parameters None

Return (`bool`) true if the attribute has a maximum value defined

is_min_value(*self*) → bool

Check if the attribute has a minimum value.

Parameters None

Return (`bool`) true if the attribute has a minimum value defined

set_max_value(*self, data*) → None

Set attribute maximum value.

Parameters

data the attribute maximum value. python data type must be compatible with the attribute data format and type.

Return None

set_min_value(*self, data*) → None

Set attribute minimum value.

Parameters

data the attribute minimum value. python data type must be compatible with the attribute data format and type.

Return None

MultiAttribute

class `PyTango.`**`MultiAttribute`**

There is one instance of this class for each device. This class is mainly an aggregate of `Attribute` or `WAttribute` objects. It eases management of multiple attributes

`check_alarm`(*self*) → bool

check_alarm *(self, attr_name)* **->** `bool`

check_alarm *(self, ind)* **->** `bool`

- The 1st version of the method checks alarm on all attribute(s) with an alarm defined.
- The 2nd version of the method checks alarm for one attribute with a given name.
- The 3rd version of the method checks alarm for one attribute from its index in the main attributes vector.

Parameters

attr_name (`str`) attribute name

ind (`int`) the attribute index

Return (`bool`) True if at least one attribute is in alarm condition

Throws `DevFailed` If at least one attribute does not have any alarm level defined

New in PyTango 7.0.0

`get_attr_by_ind`(*self, ind*) → Attribute

Get `Attribute` object from its index. This method returns an `Attribute` object from the index in the main attribute vector.

Parameters

ind (`int`) the attribute index

Return (`Attribute`) the attribute object

`get_attr_by_name`(*self, attr_name*) → Attribute

Get `Attribute` object from its name. This method returns an `Attribute` object with a name passed as parameter. The equality on attribute name is case independant.

Parameters

attr_name (`str`) attribute name

Return (`Attribute`) the attribute object

Throws `DevFailed` If the attribute is not defined.

`get_attr_ind_by_name`(*self, attr_name*) → int

Get Attribute index into the main attribute vector from its name. This method returns the index in the Attribute vector (stored in the `MultiAttribute` object) of an attribute with a given name. The name equality is case independant.

Parameters

attr_name (`str`) attribute name

Return (`int`) the attribute index

Throws `DevFailed` If the attribute is not found in the vector.

New in PyTango 7.0.0

`get_attr_nb`(*self*) → int

Get attribute number.

Parameters None

Return (`int`) the number of attributes

New in PyTango 7.0.0

`get_attribute_list`(*self*) → seq<Attribute>

Get the list of attribute objects.

Return (`seq`) list of attribute objects

New in PyTango 7.2.1

`get_w_attr_by_ind`(*self, ind*) → WAttribute

Get a writable attribute object from its index. This method returns an `WAttribute` object from the index in the main attribute vector.

Parameters

ind (`int`) the attribute index

Return (`WAttribute`) the attribute object

`get_w_attr_by_name`(*self, attr_name*) → WAttribute

Get a writable attribute object from its name. This method returns an `WAttribute` object with a name passed as parameter. The equality on attribute name is case independant.

Parameters

attr_name (`str`) attribute name

Return (`WAttribute`) the attribute object

Throws `DevFailed` If the attribute is not defined.

`read_alarm`(*self, status*) → None

Add alarm message to device status. This method add alarm mesage to the string passed as parameter. A message is added for each attribute which is in alarm condition

Parameters

status (`str`) a string (should be the device status)

Return None

New in PyTango 7.0.0

UserDefaultAttrProp

class `PyTango.`**`UserDefaultAttrProp`**

User class to set attribute default properties. This class is used to set attribute default properties. Three levels of attributes properties setting are implemented within Tango. The highest property setting level is the database. Then the user default (set using this UserDefaultAttrProp class) and finally a Tango library default value

`set_abs_change`(*self*, *def_abs_change*) → None <= DEPRECATED

Set default change event abs_change property.

Parameters

def_abs_change (`str`) the user default change event abs_change property

Return None

Deprecated since PyTango 8.0. Please use set_event_abs_change instead.

`set_archive_abs_change`(*self*, *def_archive_abs_change*) → None <= DEPRECATED

Set default archive event abs_change property.

Parameters

def_archive_abs_change (`str`) the user default archive event abs_change property

Return None

Deprecated since PyTango 8.0. Please use set_archive_event_abs_change instead.

`set_archive_event_abs_change`(*self*, *def_archive_abs_change*) → None

Set default archive event abs_change property.

Parameters

def_archive_abs_change (`str`) the user default archive event abs_change property

Return None

New in PyTango 8.0

`set_archive_event_period`(*self*, *def_archive_period*) → None

Set default archive event period property.

Parameters

def_archive_period (`str`) t

Return None

New in PyTango 8.0

`set_archive_event_rel_change`(*self*, *def_archive_rel_change*) → None

Set default archive event rel_change property.

Parameters

def_archive_rel_change (`str`) the user default archive event rel_change property

Return None

New in PyTango 8.0

`set_archive_period`(*self*, *def_archive_period*) → None <= DEPRECATED

Set default archive event period property.

Parameters

def_archive_period (`str`) t

Return None

Deprecated since PyTango 8.0. Please use set_archive_event_period instead.

`set_archive_rel_change`(*self*, *def_archive_rel_change*) → None <= DEPRECATED

Set default archive event rel_change property.

Parameters

def_archive_rel_change (`str`) the user default archive event rel_change property

Return None

Deprecated since PyTango 8.0. Please use set_archive_event_rel_change instead.

`set_delta_t`(*self*, *def_delta_t*) → None

Set default RDS alarm delta_t property.

Parameters

def_delta_t (`str`) the user default RDS alarm delta_t property

Return None

`set_delta_val`(*self*, *def_delta_val*) → None

Set default RDS alarm delta_val property.

Parameters

def_delta_val (`str`) the user default RDS alarm delta_val property

Return None

`set_description`(*self*, *def_description*) → None

Set default description property.

Parameters

def_description (`str`) the user default description property

Return None

`set_display_unit`(*self*, *def_display_unit*) → None

Set default display unit property.

Parameters

def_display_unit (`str`) the user default display unit property

Return None

`set_event_abs_change`(*self*, *def_abs_change*) → None

Set default change event abs_change property.

Parameters

def_abs_change (`str`) the user default change event abs_change property

Return None

New in PyTango 8.0

`set_event_period`(*self*, *def_period*) → None

Set default periodic event period property.

Parameters

def_period (`str`) the user default periodic event period property

Return None

New in PyTango 8.0

`set_event_rel_change`(*self*, *def_rel_change*) → None

Set default change event rel_change property.

Parameters

def_rel_change (`str`) the user default change event rel_change property

Return None

New in PyTango 8.0

`set_format`(*self*, *def_format*) → None

Set default format property.

Parameters

def_format (`str`) the user default format property

Return None

`set_label`(*self*, *def_label*) → None

Set default label property.

Parameters

def_label (`str`) the user default label property

Return None

`set_max_alarm`(*self*, *def_max_alarm*) → None

Set default max_alarm property.

Parameters

def_max_alarm (`str`) the user default max_alarm property

Return None

`set_max_value`(*self*, *def_max_value*) → None

Set default max_value property.

Parameters

def_max_value (`str`) the user default max_value property

Return None

`set_max_warning`(*self*, *def_max_warning*) → None

Set default max_warning property.

Parameters

def_max_warning (`str`) the user default max_warning property

Return None

`set_min_alarm`(*self*, *def_min_alarm*) → None

Set default min_alarm property.

Parameters

def_min_alarm (`str`) the user default min_alarm property

Return None

`set_min_value`(*self*, *def_min_value*) → None

Set default min_value property.

Parameters

def_min_value (`str`) the user default min_value property

Return None

`set_min_warning`(*self*, *def_min_warning*) → None

Set default min_warning property.

Parameters

def_min_warning (`str`) the user default min_warning property

Return None

`set_period`(*self*, *def_period*) → None <= DEPRECATED

Set default periodic event period property.

Parameters

def_period (`str`) the user default periodic event period property

Return None

Deprecated since PyTango 8.0. Please use set_event_period instead.

`set_rel_change`(*self*, *def_rel_change*) → None <= DEPRECATED

Set default change event rel_change property.

Parameters

def_rel_change (`str`) the user default change event rel_change property

Return None

Deprecated since PyTango 8.0. Please use set_event_rel_change instead.

set_standard_unit(*self*, *def_standard_unit*) → None

Set default standard unit property.

Parameters

def_standard_unit (str) the user default standard unit property

Return None

set_unit(*self*, *def_unit*) → None

Set default unit property.

Parameters

def_unit (str) te user default unit property

Return None

5.3.6 Util

class PyTango.**Util**(*args*)

This class is a used to store TANGO device server process data and to provide the user with a set of utilities method.

This class is implemented using the singleton design pattern. Therefore a device server process can have only one instance of this class and its constructor is not public. Example:

```
util = PyTango.Util.instance()
    print(util.get_host_name())
```

add_Cpp_TgClass(*device_class_name*, *tango_device_class_name*)

Register a new C++ tango class.

If there is a shared library file called MotorClass.so which contains a MotorClass class and a _create_MotorClass_class method. Example:

```
util.add_Cpp_TgClass('MotorClass', 'Motor')
```

Note: the parameter 'device_class_name' must match the shared library name.

Deprecated since version 7.1.2: Use PyTango.Util.add_class() instead.

add_TgClass(*klass_device_class*, *klass_device*, *device_class_name=None*)

Register a new python tango class. Example:

```
util.add_TgClass(MotorClass, Motor)
util.add_TgClass(MotorClass, Motor, 'Motor') # equivalent to previous line
```

Deprecated since version 7.1.2: Use PyTango.Util.add_class() instead.

add_class(*self*, *class<DeviceClass>*, *class<DeviceImpl>*, *language="python"*) → None

Register a new tango class ('python' or 'c++').

If language is 'python' then args must be the same as `PyTango.Util.add_TgClass()`. Otherwise, args should be the ones in `PyTango.Util.add_Cpp_TgClass()`. Example:

```
util.add_class(MotorClass, Motor)
util.add_class('CounterClass', 'Counter', language='c++')
```

New in PyTango 7.1.2

connect_db (*self*) → None

Connect the process to the TANGO database. If the connection to the database failed, a message is displayed on the screen and the process is aborted

Parameters None

Return None

create_device (*self, klass_name, device_name, alias=None, cb=None*) → None

Creates a new device of the given class in the database, creates a new DeviceImpl for it and calls init_device (just like it is done for existing devices when the DS starts up)

An optional parameter callback is called AFTER the device is registered in the database and BEFORE the init_device for the newly created device is called

Throws PyTango.DevFailed:

- the device name exists already or
- the given class is not registered for this DS.
- the cb is not a callable

New in PyTango 7.1.2

Parameters

klass_name (`str`) the device class name

device_name (`str`) the device name

alias (`str`) optional alias. Default value is None meaning do not create device alias

cb (`callable`) a callback that is called AFTER the device is registered in the database and BEFORE the init_device for the newly created device is called. Typically you may want to put device and/or attribute properties in the database here. The callback must receive a parameter: device name (str). Default value is None meaning no callback

Return None

delete_device (*self, klass_name, device_name*) → None

Deletes an existing device from the database and from this running server

Throws PyTango.DevFailed:

- the device name doesn't exist in the database
- the device name doesn't exist in this DS.

New in PyTango 7.1.2

Parameters

klass_name (`str`) the device class name

device_name (`str`) the device name

Return None

get_class_list(*self*) → seq<DeviceClass>

Returns a list of objects of inheriting from DeviceClass

Parameters None

Return (`seq`) a list of objects of inheriting from DeviceClass

get_database(*self*) → Database

Get a reference to the TANGO database object

Parameters None

Return (`Database`) the database

New in PyTango 7.0.0

get_device_by_name(*self*, *dev_name*) → DeviceImpl

Get a device reference from its name

Parameters

dev_name (`str`) The TANGO device name

Return (`DeviceImpl`) The device reference

New in PyTango 7.0.0

get_device_list(*self*) → sequence<DeviceImpl>

Get device list from name. It is possible to use a wild card ('*') in the name parameter (e.g. "*", "/tango/tangotest/n*", ...)

Parameters None

Return (sequence<`DeviceImpl`>) the list of device objects

New in PyTango 7.0.0

get_device_list_by_class(*self*, *class_name*) → sequence<DeviceImpl>

Get the list of device references for a given TANGO class. Return the list of references for all devices served by one implementation of the TANGO device pattern implemented in the process.

Parameters

class_name (`str`) The TANGO device class name

Return (sequence<`DeviceImpl`>) The device reference list

New in PyTango 7.0.0

get_ds_exec_name(*self*) → str

Get a COPY of the device server executable name.

Parameters None

Return (`str`) a COPY of the device server executable name.

New in PyTango 3.0.4

get_ds_inst_name(*self*) → str

Get a COPY of the device server instance name.

Parameters None

Return (`str`) a COPY of the device server instance name.

New in PyTango 3.0.4

get_ds_name(*self*) → str

Get the device server name. The device server name is the <device server executable name>/<the device server instance name>

Parameters None

Return (`str`) device server name

New in PyTango 3.0.4

get_dserver_device(*self*) → DServer

Get a reference to the dserver device attached to the device server process

Parameters None

Return (`DServer`) A reference to the dserver device

New in PyTango 7.0.0

get_dserver_device *(self)* **->** `DServer`

Get a reference to the dserver device attached to the device server process.

Parameters None

Return (`DServer`) the dserver device attached to the device server process

New in PyTango 7.0.0

get_host_name(*self*) → str

Get the host name where the device server process is running.

Parameters None

Return (`str`) the host name where the device server process is running

New in PyTango 3.0.4

get_pid(*self*) → TangoSys_Pid

Get the device server process identifier.

Parameters None

Return (`int`) the device server process identifier

get_pid_str(*self*) → str

Get the device server process identifier as a string.

Parameters None

Return (`str`) the device server process identifier as a string

New in PyTango 3.0.4

`get_polling_threads_pool_size`(*self*) → int

Get the polling threads pool size.

Parameters None

Return (`int`) the maximun number of threads in the polling threads pool

`get_serial_model`(*self*) → SerialModel

Get the serialization model.

Parameters None

Return (`SerialModel`) the serialization model

`get_server_version`(*self*) → str

Get the device server version.

Parameters None

Return (`str`) the device server version.

`get_sub_dev_diag`(*self*) → SubDevDiag

Get the internal sub device manager

Parameters None

Return (`SubDevDiag`) the sub device manager

New in PyTango 7.0.0

`get_tango_lib_release`(*self*) → int

Get the TANGO library version number.

Parameters None

Return (`int`) The Tango library release number coded in 3 digits (for instance 550,551,552,600,....)

`get_trace_level`(*self*) → int

Get the process trace level.

Parameters None

Return (`int`) the process trace level.

`get_version_str`(*self*) → str

Get the IDL TANGO version.

Parameters None

Return (`str`) the IDL TANGO version.

New in PyTango 3.0.4

is_device_restarting(*self, (str)dev_name*) → bool

Check if the device is actually restarted by the device server process admin device with its DevRestart command

Parameters dev_name : (str) device name

Return (`bool`) True if the device is restarting.

New in PyTango 8.0.0

is_svr_shutting_down(*self*) → bool

Check if the device server process is in its shutting down sequence

Parameters None

Return (`bool`) True if the server is in its shutting down phase.

New in PyTango 8.0.0

is_svr_starting(*self*) → bool

Check if the device server process is in its starting phase

Parameters None

Return (`bool`) True if the server is in its starting phase

New in PyTango 8.0.0

reset_filedatabase(*self*) → None

Reread the file database

Parameters None

Return None

New in PyTango 7.0.0

reset_filedatabase *(self)* **->** `None`

Reread the file database.

Parameters None

Return None

server_init(*self, with_window = False*) → None

Initialize all the device server pattern(s) embedded in a device server process.

Parameters

with_window (`bool`) default value is False

Return None

Throws `DevFailed` If the device pattern initialistaion failed

server_run(*self*) → None

Run the CORBA event loop. This method runs the CORBA event loop. For UNIX or Linux operating system, this method does not return. For Windows in a non-console mode, this method start a thread which enter the CORBA event loop.

Parameters None

Return None

server_set_event_loop(*self*, *event_loop*) → None

This method registers an event loop function in a Tango server. This function will be called by the process main thread in an infinite loop The process will not use the classical ORB blocking event loop. It is the user responsability to code this function in a way that it implements some kind of blocking in order not to load the computer CPU. The following piece of code is an example of how you can use this feature:

```
_LOOP_NB = 1
def looping():
    global _LOOP_NB
    print "looping", _LOOP_NB
    time.sleep(0.1)
    _LOOP_NB += 1
    return _LOOP_NB > 100

def main():
    py = PyTango.Util(sys.argv)

    # ...

    U = PyTango.Util.instance()
    U.server_set_event_loop(looping)
    U.server_init()
    U.server_run()
```

Parameters None

Return None

New in PyTango 8.1.0

set_polling_threads_pool_size(*self*, *thread_nb*) → None

Set the polling threads pool size.

Parameters

thread_nb (`int`) the maximun number of threads in the polling threads pool

Return None

New in PyTango 7.0.0

set_serial_model(*self*, *ser*) → None

Set the serialization model.

Parameters

ser (`SerialModel`) the new serialization model. The serialization model must be one of BY_DEVICE, BY_CLASS, BY_PROCESS or NO_SYNC

Return None

set_server_version(*self*, *vers*) → None

Set the device server version.

Parameters

vers (`str`) the device server version

Return None

`set_trace_level`(*self*, *level*) → None

Set the process trace level.

Parameters

level (`int`) the new process level

Return None

`trigger_attr_polling`(*self*, *dev*, *name*) → None

Trigger polling for polled attribute. This method send the order to the polling thread to poll one object registered with an update period defined as "externally triggerred"

Parameters

dev (`DeviceImpl`) the TANGO device

name (`str`) the attribute name which must be polled

Return None

`trigger_cmd_polling`(*self*, *dev*, *name*) → None

Trigger polling for polled command. This method send the order to the polling thread to poll one object registered with an update period defined as "externally triggerred"

Parameters

dev (`DeviceImpl`) the TANGO device

name (`str`) the command name which must be polled

Return None

Throws `DevFailed` If the call failed

`unregister_server`(*self*) → None

Unregister a device server process from the TANGO database. If the database call fails, a message is displayed on the screen and the process is aborted

Parameters None

Return None

New in PyTango 7.0.0

unregister_server *(self)* **->** `None`

Unregister a device server process from the TANGO database.

Parameters None

Return None

5.4 Database API

class PyTango.**Database**

Database is the high level Tango object which contains the link to the static database. Database provides methods for all database commands : get_device_property(), put_device_property(), info(), etc.. To create a Database, use the default constructor. Example:

```
db = Database()
```

The constructor uses the TANGO_HOST env. variable to determine which instance of the Database to connect to.

add_device(*self*, *dev_info*) → None

Add a device to the database. The device name, server and class are specified in the DbDevInfo structure

Example

```
dev_info = DbDevInfo()
dev_info.name = 'my/own/device'
dev_info._class = 'MyDevice'
dev_info.server = 'MyServer/test'
db.add_device(dev_info)
```

Parameters

dev_info (DbDevInfo) device information

Return None

add_server(*self*, *servname*, *dev_info*) → None

Add a (group of) devices to the database.

Parameters

servname (str) server name

dev_info (sequence<DbDevInfo> | DbDevInfos | DbDevInfo) containing the server device(s) information

Return None

Throws ConnectionFailed, CommunicationFailed, DevFailed from device (DB_SQLError)

build_connection(*self*) → None

Tries to build a connection to the Database server.

Parameters None

Return None

New in PyTango 7.0.0

check_access_control(*self*, *dev_name*) → AccessControlType

Check the access for the given device for this client.

Parameters

dev_name (`str`) device name

Return the access control type as a AccessControlType object

New in PyTango 7.0.0

`check_tango_host`(*self*, *tango_host_env*) → None

Check the TANGO_HOST environment variable syntax and extract database server host(s) and port(s) from it.

Parameters

tango_host_env (`str`) The TANGO_HOST env. variable value

Return None

New in PyTango 7.0.0

`delete_attribute_alias`(*self*, *alias*) → None

Remove the alias associated to an attribute name.

Parameters

alias (`str`) alias

Return None

Throws `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device (DB_SQLError)

`delete_class_attribute_property`(*self*, *class_name*, *value*) → None

Delete a list of attribute properties for the specified class.

Parameters

class_name (`str`) class name

propnames can be one of the following:

1. DbData [in] - several property data to be deleted
2. sequence<str> [in]- several property data to be deleted
3. sequence<DbDatum> [in] - several property data to be deleted
4. dict<str, seq<str>> keys are attribute names and value being a list of attribute property names

Return None

Throws `ConnectionFailed`, `CommunicationFailed` `DevFailed` from device (DB_SQLError)

`delete_class_property`(*self*, *class_name*, *value*) → None

Delete a the given of properties for the specified class.

Parameters

class_name (`str`) class name

value can be one of the following:

1. str [in] - single property data to be deleted
2. DbDatum [in] - single property data to be deleted

3. DbData [in] - several property data to be deleted
4. sequence<str> [in]- several property data to be deleted
5. sequence<DbDatum> [in] - several property data to be deleted
6. dict<str, obj> [in] - keys are property names to be deleted (values are ignored)
7. dict<str, DbDatum> [in] - several DbDatum.name are property names to be deleted (keys are ignored)

Return None

Throws `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device (DB_SQLError)

`delete_device`(*self*, *dev_name*) → None

Delete the device of the specified name from the database.

Parameters

dev_name (`str`) device name

Return None

`delete_device_alias`(*self*, *alias*) → void

Delete a device alias

Parameters

alias (`str`) alias name

Return None

`delete_device_attribute_property`(*self*, *dev_name*, *value*) → None

Delete a list of attribute properties for the specified device.

Parameters

devname (`string`) device name

propnames can be one of the following: 1. DbData [in] - several property data to be deleted 2. sequence<str> [in]- several property data to be deleted 3. sequence<DbDatum> [in] - several property data to be deleted 3. dict<str, seq<str>> keys are attribute names and value being a list of attribute property names

Return None

Throws `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device (DB_SQLError)

`delete_device_property`(*self*, *dev_name*, *value*) → None

Delete a the given of properties for the specified device.

Parameters

dev_name (`str`) object name

value can be one of the following: 1. str [in] - single property data to be deleted 2. DbDatum [in] - single property data to be deleted 3. DbData [in] - several property data to be deleted

4. sequence<str> [in]- several property data to be deleted 5. sequence<DbDatum> [in] - several property data to be deleted 6. dict<str, obj> [in] - keys are property names to be deleted (values are ignored) 7. dict<str, DbDatum> [in] - several DbDatum.name are property names to be deleted (keys are ignored)

Return None

Throws `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device (DB_SQLError)

`delete_property`(*self*, *obj_name*, *value*) → None

Delete a the given of properties for the specified object.

Parameters

obj_name (`str`) object name

value can be one of the following:

1. str [in] - single property data to be deleted
2. DbDatum [in] - single property data to be deleted
3. DbData [in] - several property data to be deleted
4. sequence<string> [in]- several property data to be deleted
5. sequence<DbDatum> [in] - several property data to be deleted
6. dict<str, obj> [in] - keys are property names to be deleted (values are ignored)
7. dict<str, DbDatum> [in] - several DbDatum.name are property names to be deleted (keys are ignored)

Return None

Throws `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device (DB_SQLError)

`delete_server`(*self*, *server*) → None

Delete the device server and its associated devices from database.

Parameters

server (`str`) name of the server to be deleted with format: <server name>/<instance>

Return None

`delete_server_info`(*self*, *server*) → None

Delete server information of the specifed server from the database.

Parameters

server (`str`) name of the server to be deleted with format: <server name>/<instance>

Return None

Throws `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device (DB_SQLError)

New in PyTango 3.0.4

export_device(*self*, *dev_export*) → None

Update the export info for this device in the database.

Example

```
dev_export = DbDevExportInfo()
dev_export.name = 'my/own/device'
dev_export.ior = <the real ior>
dev_export.host = <the host>
dev_export.version = '3.0'
dev_export.pid = '....'
db.export_device(dev_export)
```

Parameters

dev_export (`DbDevExportInfo`) export information

Return None

export_event(*self*, *event_data*) → None

Export an event to the database.

Parameters

eventdata (sequence<`str`>) event data (same as DbExportEvent Database command)

Return None

Throws `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device (DB_SQLError)

New in PyTango 7.0.0

export_server(*self*, *dev_info*) → None

Export a group of devices to the database.

Parameters

devinfo (sequence<DbDevExportInfo> | DbDevExportInfos | DbDevExportInfo) containing the device(s) to export information

Return None

Throws `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device (DB_SQLError)

get_access_except_errors(*self*) → DevErrorList

Returns a reference to the control access exceptions.

Parameters None

Return DevErrorList

New in PyTango 7.0.0

get_alias(*self*, *alias*) → str

Get the device alias name from its name.

Parameters

alias (`str`) device name

Return alias

New in PyTango 3.0.4

Deprecated since version 8.1.0: Use `get_alias_from_device()` instead

`get_alias_from_attribute`(*self*, *attr_name*) → str

Get the attribute alias from the full attribute name.

Parameters

attr_name (`str`) full attribute name

Return attribute alias

Throws `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device (DB_SQLError)

New in PyTango 8.1.0

`get_alias_from_device`(*self*, *alias*) → str

Get the device alias name from its name.

Parameters

alias (`str`) device name

Return alias

New in PyTango 8.1.0

`get_attribute_alias`(*self*, *alias*) → str

Get the full attribute name from an alias.

Parameters

alias (`str`) attribute alias

Return full attribute name

Throws `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device (DB_SQLError)

Deprecated since version 8.1.0: Use `:class:`'`Database()`.get_attribute_from_alias' instead

`get_attribute_alias_list`(*self*, *filter*) → DbDatum

Get attribute alias list. The parameter alias is a string to filter the alias list returned. Wildcard (*) is supported. For instance, if the string alias passed as the method parameter is initialised with only the * character, all the defined attribute alias will be returned. If there is no alias with the given filter, the returned array will have a 0 size.

Parameters

filter (`str`) attribute alias filter

Return DbDatum containing the list of matching attribute alias

Throws `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device (DB_SQLError)

`get_attribute_from_alias`(*self*, *alias*) → str

Get the full attribute name from an alias.

Parameters

alias (`str`) attribute alias

Return full attribute name

Throws `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device (DB_SQLError)

New in PyTango 8.1.0

`get_class_attribute_list`(*self*, *class_name*, *wildcard*) → DbDatum

Query the database for a list of attributes defined for the specified class which match the specified wildcard.

Parameters

class_name (`str`) class name

wildcard (`str`) attribute name

Return DbDatum containing the list of matching attributes for the given class

Throws `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device (DB_SQLError)

New in PyTango 7.0.0

`get_class_attribute_property`(*self*, *class_name*, *value*) → dict<str, dict<str, seq<str>>

Query the database for a list of class attribute properties for the specified class. The method returns all the properties for the specified attributes.

Parameters

class_name (`str`) class name

propnames can be one of the following:

1. str [in] - single attribute properties to be fetched
2. DbDatum [in] - single attribute properties to be fetched
3. DbData [in,out] - several attribute properties to be fetched In this case (direct C++ API) the DbData will be filled with the property values
4. sequence<str> [in] - several attribute properties to be fetched
5. sequence<DbDatum> [in] - several attribute properties to be fetched
6. dict<str, obj> [in,out] - keys are attribute names In this case the given dict values will be changed to contain the several attribute property values

Return a dictionary which keys are the attribute names the value associated with each key being a another dictionary where keys are property names and value is a sequence of strings being the property value.

Throws `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device (DB_SQLError)

`get_class_attribute_property_history`(*self*, *dev_name*, *attr_name*, *prop_name*) → DbHistoryList

Delete a list of properties for the specified class. This corresponds to the pure C++ API call.

Parameters

dev_name (`str`) device name

attr_name (`str`) attribute name

prop_name (`str`) property name

Return DbHistoryList containing the list of modifications

Throws `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device (DB_SQLError)

New in PyTango 7.0.0

`get_class_for_device`(*self*, *dev_name*) → str

Return the class of the specified device.

Parameters

dev_name (`str`) device name

Return a string containing the device class

get_class_for_device *(self, dev_name)* **->** `str`

Return the class of the specified device.

Parameters

dev_name (`str`) device name

Return a string containing the device class

`get_class_inheritance_for_device`(*self*, *dev_name*) → DbDatum

Return the class inheritance scheme of the specified device.

Parameters

devn_ame (`str`) device name

Return DbDatum with the inheritance class list

New in PyTango 7.0.0

`get_class_list`(*self*, *wildcard*) → DbDatum

Query the database for a list of classes which match the specified wildcard

Parameters

wildcard (`str`) class wildcard

Return DbDatum containing the list of matching classes

Throws `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device (DB_SQLError)

New in PyTango 7.0.0

`get_class_property`(*self*, *class_name*, *value*) → dict<str, seq<str>>

Query the database for a list of class properties.

Parameters

class_name (`str`) class name

value can be one of the following:

1. str [in] - single property data to be fetched
2. PyTango.DbDatum [in] - single property data to be fetched
3. PyTango.DbData [in,out] - several property data to be fetched In this case (direct C++ API) the DbData will be filled with the property values
4. sequence<str> [in] - several property data to be fetched
5. sequence<DbDatum> [in] - several property data to be fetched
6. dict<str, obj> [in,out] - keys are property names In this case the given dict values will be changed to contain the several property values

Return a dictionary which keys are the property names the value associated with each key being a a sequence of strings being the property value.

Throws `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device (DB_SQLError)

get_class_property_history(*self*, *class_name*, *prop_name*) → DbHistoryList

Get the list of the last 10 modifications of the specified class property. Note that propname can contain a wildcard character (eg: 'prop*').

Parameters

class_name (`str`) class name

prop_name (`str`) property name

Return DbHistoryList containing the list of modifications

Throws `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device (DB_SQLError)

New in PyTango 7.0.0

get_class_property_list(*self*, *class_name*) → DbDatum

Query the database for a list of properties defined for the specified class.

Parameters

class_name (`str`) class name

Return DbDatum containing the list of properties for the specified class

Throws `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device (DB_SQLError)

get_device_alias(*self*, *alias*) → str

Get the device name from an alias.

Parameters

alias (`str`) alias

Return device name

Deprecated since version 8.1.0: Use `get_device_from_alias()` instead

`get_device_alias_list`(*self*, *filter*) → DbDatum

Get device alias list. The parameter alias is a string to filter the alias list returned. Wildcard (*) is supported.

Parameters

filter (`str`) a string with the alias filter (wildcard (*) is supported)

Return DbDatum with the list of device names

New in PyTango 7.0.0

`get_device_attribute_property`(*self*, *dev_name*, *value*) → dict<str, dict<str, seq<str>>>

Query the database for a list of device attribute properties for the specified device. The method returns all the properties for the specified attributes.

Parameters

dev_name (`string`) device name

value can be one of the following:

1. str [in] - single attribute properties to be fetched
2. DbDatum [in] - single attribute properties to be fetched
3. DbData [in,out] - several attribute properties to be fetched In this case (direct C++ API) the DbData will be filled with the property values
4. sequence<str> [in] - several attribute properties to be fetched
5. sequence<DbDatum> [in] - several attribute properties to be fetched
6. dict<str, obj> [in,out] - keys are attribute names In this case the given dict values will be changed to contain the several attribute property values

Return a dictionary which keys are the attribute names the value associated with each key being a another dictionary where keys are property names and value is a DbDatum containing the property value.

Throws `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device (DB_SQLError)

`get_device_attribute_property_history`(*self*, *dev_name*, *att_name*, *prop_name*) → DbHistoryList

Get the list of the last 10 modifications of the specified device attribute property. Note that propname and devname can contain a wildcard character (eg: 'prop*').

Parameters

dev_name (`str`) device name

attn_ame (`str`) attribute name

prop_name (`str`) property name

Return DbHistoryList containing the list of modifications

Throws `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device (DB_SQLError)

New in PyTango 7.0.0

get_device_class_list(*self*, *server*) → DbDatum

Query the database for a list of devices and classes served by the specified server. Return a list with the following structure: [device name, class name, device name, class name, ...]

Parameters

server (`str`) name of the server with format: <server name>/<instance>

Return DbDatum containing list with the following structure: [device_name, class name]

Throws `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device (DB_SQLError)

New in PyTango 3.0.4

get_device_domain(*self*, *wildcard*) → DbDatum

Query the database for a list of of device domain names which match the wildcard provided (* is wildcard for any character(s)). Domain names are case insensitive.

Parameters

wildcard (`str`) domain filter

Return DbDatum with the list of device domain names

get_device_exported(*self*, *filter*) → DbDatum

Query the database for a list of exported devices whose names satisfy the supplied filter (* is wildcard for any character(s))

Parameters

filter (`str`) device name filter (wildcard)

Return DbDatum with the list of exported devices

get_device_exported_for_class(*self*, *class_name*) → DbDatum

Query database for list of exported devices for the specified class.

Parameters

class_name (`str`) class name

Return DbDatum with the list of exported devices for the

New in PyTango 7.0.0

get_device_family(*self*, *wildcard*) → DbDatum

Query the database for a list of of device family names which match the wildcard provided (* is wildcard for any character(s)). Family names are case insensitive.

Parameters

wildcard (`str`) family filter

Return DbDatum with the list of device family names

get_device_from_alias(*self*, *alias*) → str

Get the device name from an alias.

Parameters

alias (str) alias

Return device name

New in PyTango 8.1.0

get_device_info (*self, dev_name*) → DbDevFullInfo

Query the databse for the full info of the specified device.

Example

```
dev_info = db.get_device_info('my/own/device')
print(dev_info.name)
print(dev_info.class_name)
print(dev_info.ds_full_name)
print(dev_info.exported)
print(dev_info.ior)
print(dev_info.version)
print(dev_info.pid)
print(dev_info.started_date)
print(dev_info.stopped_date)
```

Parameters

dev_name (str) device name

Return DbDevFullInfo

New in PyTango 8.1.0

get_device_member (*self, wildcard*) → DbDatum

Query the database for a list of of device member names which match the wildcard provided (* is wildcard for any character(s)). Member names are case insensitive.

Parameters

wildcard (str) member filter

Return DbDatum with the list of device member names

get_device_name (*self, serv_name, class_name*) → DbDatum

Query the database for a list of devices served by a server for a given device class

Parameters

serv_name (str) server name

class_name (str) device class name

Return DbDatum with the list of device names

get_device_property (*self, dev_name, value*) → dict<str, seq<str>>

Query the database for a list of device properties.

Parameters

dev_name (str) object name

value can be one of the following:

1. str [in] - single property data to be fetched
2. DbDatum [in] - single property data to be fetched
3. DbData [in,out] - several property data to be fetched In this case (direct C++ API) the DbData will be filled with the property values
4. sequence<str> [in] - several property data to be fetched
5. sequence<DbDatum> [in] - several property data to be fetched
6. dict<str, obj> [in,out] - keys are property names In this case the given dict values will be changed to contain the several property values

Return a dictionary which keys are the property names the value associated with each key being a a sequence of strings being the property value.

Throws `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device (DB_SQLError)

`get_device_property_history`(*self*, *dev_name*, *prop_name*) → DbHistoryList

Get the list of the last 10 modifications of the specified device property. Note that propname can contain a wildcard character (eg: 'prop*'). This corresponds to the pure C++ API call.

Parameters

serv_name (`str`) server name

prop_name (`str`) property name

Return DbHistoryList containing the list of modifications

Throws `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device (DB_SQLError)

New in PyTango 7.0.0

`get_device_property_list`(*self*, *dev_name*, *wildcard*, *array=None*) → DbData

Query the database for a list of properties defined for the specified device and which match the specified wildcard. If array parameter is given, it must be an object implementing de 'append' method. If given, it is filled with the matching property names. If not given the method returns a new DbDatum containing the matching property names.

New in PyTango 7.0.0

Parameters

dev_name (`str`) device name

wildcard (`str`) property name wildcard

array [out] (sequence) (optional) array that will contain the matching property names.

Return if container is None, return is a new DbDatum containing the matching property names. Otherwise returns the given array filled with the property names

Throws `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device

`get_device_service_list`(*self*, *dev_name*) → DbDatum

Query database for the list of services provided by the given device.

Parameters

dev_name (`str`) device name

Return DbDatum with the list of services

New in PyTango 8.1.0

`get_file_name`(*self*) → str

Returns the database file name or throws an exception if not using a file database

Parameters None

Return a string containing the database file name

Throws `DevFailed`

New in PyTango 7.2.0

`get_host_list`(*self*) → DbDatum

get_host_list *(self, wildcard)* **->** `DbDatum`

Returns the list of all host names registered in the database.

Parameters

wildcard (`str`) (optional) wildcard (eg: 'l-c0*')

Return DbDatum with the list of registered host names

`get_host_server_list`(*self*, *host_name*) → DbDatum

Query the database for a list of servers registred on the specified host.

Parameters

host_name (`str`) host name

Return DbDatum containing list of servers for the specified host

Throws `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device (DB_SQLError)

New in PyTango 3.0.4

`get_info`(*self*) → str

Query the database for some general info about the tables.

Parameters None

Return a multiline string

`get_instance_name_list`(*self*, *serv_name*) → DbDatum

Return the list of all instance names existing in the database for the specifed server.

Parameters

serv_name (`str`) server name with format <server name>

Return DbDatum containing list of instance names for the specified server

Throws `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device (DB_SQLError)

New in PyTango 3.0.4

`get_object_list`(*self*, *wildcard*) → DbDatum

Query the database for a list of object (free properties) for which properties are defined and which match the specified wildcard.

Parameters

wildcard (`str`) object wildcard

Return DbDatum containing the list of object names matching the given wildcard

Throws `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device (DB_SQLError)

New in PyTango 7.0.0

`get_object_property_list`(*self*, *obj_name*, *wildcard*) → DbDatum

Query the database for a list of properties defined for the specified object and which match the specified wildcard.

Parameters

obj_name (`str`) object name

wildcard (`str`) property name wildcard

Return DbDatum with list of properties defined for the specified object and which match the specified wildcard

Throws `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device (DB_SQLError)

New in PyTango 7.0.0

`get_property`(*self*, *obj_name*, *value*) → dict<str, seq<str>>

Query the database for a list of object (i.e non-device) properties.

Parameters

obj_name (`str`) object name

value can be one of the following:

1. str [in] - single property data to be fetched
2. DbDatum [in] - single property data to be fetched
3. DbData [in,out] - several property data to be fetched In this case (direct C++ API) the DbData will be filled with the property values
4. sequence<str> [in] - several property data to be fetched
5. sequence<DbDatum> [in] - several property data to be fetched
6. dict<str, obj> [in,out] - keys are property names In this case the given dict values will be changed to contain the several property values

Return a dictionary which keys are the property names the value associated with each key being a a sequence of strings being the property value.

Throws `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device (DB_SQLError)

get_property_forced(*obj_name*, *value*)
get_property(self, obj_name, value) -> dict<str, seq<str>>

Query the database for a list of object (i.e non-device) properties.

Parameters

obj_name (`str`) object name

value can be one of the following:

1. str [in] - single property data to be fetched
2. DbDatum [in] - single property data to be fetched
3. DbData [in,out] - several property data to be fetched In this case (direct C++ API) the DbData will be filled with the property values
4. sequence<str> [in] - several property data to be fetched
5. sequence<DbDatum> [in] - several property data to be fetched
6. dict<str, obj> [in,out] - keys are property names In this case the given dict values will be changed to contain the several property values

Return a dictionary which keys are the property names the value associated with each key being a a sequence of strings being the property value.

Throws `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device (DB_SQLError)

get_property_history(*self*, *obj_name*, *prop_name*) → DbHistoryList

Get the list of the last 10 modifications of the specifed object property. Note that propname can contain a wildcard character (eg: 'prop*')

Parameters

serv_name (`str`) server name

prop_name (`str`) property name

Return DbHistoryList containing the list of modifications

Throws `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device (DB_SQLError)

New in PyTango 7.0.0

get_server_class_list(*self*, *server*) → DbDatum

Query the database for a list of classes instancied by the specified server. The DServer class exists in all TANGO servers and for this reason this class is removed from the returned list.

Parameters

server (`str`) name of the server to be deleted with format: <server name>/<instance>

Return DbDatum containing list of class names instanciated by the specified server

Throws `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device (DB_SQLError)

New in PyTango 3.0.4

`get_server_info`(*self*, *server*) → DbServerInfo

Query the database for server information.

Parameters

server (`str`) name of the server to be unexported with format: <server name>/<instance>

Return DbServerInfo with server information

Throws `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device (DB_SQLError)

New in PyTango 3.0.4

`get_server_list`(*self*) → DbDatum
get_server_list *(self, wildcard)* **->** `DbDatum`

Return the list of all servers registered in the database. If wildcard parameter is given, then the the list of servers registred on the specified host (we refer 'host' in the context of tango device, i.e. following the tango naming convention 'host/family/member') is returned

Parameters

wildcard (`str`) host wildcard

Return DbDatum containing list of registered servers

`get_server_name_list`(*self*) → DbDatum

Return the list of all server names registered in the database.

Parameters None

Return DbDatum containing list of server names

Throws `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device (DB_SQLError)

New in PyTango 3.0.4

`get_services`(*self*, *serv_name*, *inst_name*) → DbDatum

Query database for specified services.

Parameters

serv_name (`str`) service name

inst_name (`str`) instance name (can be a wildcard character ('*'))

Return DbDatum with the list of available services

New in PyTango 3.0.4

`import_device`(*self*, *dev_name*) → DbDevImportInfo

Query the databse for the export info of the specified device.

Example

```
dev_imp_info = db.import_device('my/own/device')
print(dev_imp_info.name)
print(dev_imp_info.exported)
print(dev_imp_info.ior)
print(dev_imp_info.version)
```

Parameters

dev_name (`str`) device name

Return DbDevImportInfo

`is_control_access_checked`(*self*) → bool

Returns True if control access is checked or False otherwise.

Parameters None

Return (`bool`) True if control access is checked or False

New in PyTango 7.0.0

`is_multi_tango_host`(*self*) → bool

Returns if in multi tango host.

Parameters None

Return True if multi tango host or False otherwise

New in PyTango 7.1.4

`put_attribute_alias`(*self, attr_name, alias*) → None

Set an alias for an attribute name. The attribute alias is specified by aliasname and the attribute name is specifed by attname. If the given alias already exists, a DevFailed exception is thrown.

Parameters

attr_name (`str`) full attribute name

alias (`str`) alias

Return None

Throws `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device (DB_SQLError)

`put_class_attribute_property`(*self, class_name, value*) → None

Insert or update a list of properties for the specified class.

Parameters

class_name (`str`) class name

propdata can be one of the following:

1. PyTango.DbData - several property data to be inserted
2. sequence<DbDatum> - several property data to be inserted

3. dict<str, dict<str, obj>> keys are attribute names and value being another dictionary which keys are the attribute property names and the value associated with each key being:

   3.1 seq<str> 3.2 PyTango.DbDatum

Return None

Throws `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device (DB_SQLError)

`put_class_property`(*self*, *class_name*, *value*) → None

Insert or update a list of properties for the specified class.

Parameters

class_name (`str`) class name

value can be one of the following: 1. DbDatum - single property data to be inserted 2. DbData - several property data to be inserted 3. sequence<DbDatum> - several property data to be inserted 4. dict<str, DbDatum> - keys are property names and value has data to be inserted 5. dict<str, obj> - keys are property names and str(obj) is property value 6. dict<str, seq<str>> - keys are property names and value has data to be inserted

Return None

Throws `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device (DB_SQLError)

`put_device_alias`(*self*, *dev_name*, *alias*) → None

Query database for list of exported devices for the specified class.

Parameters

dev_name (`str`) device name

alias (`str`) alias name

Return None

`put_device_attribute_property`(*self*, *dev_name*, *value*) → None

Insert or update a list of properties for the specified device.

Parameters

dev_name (`str`) device name

value can be one of the following:

1. DbData - several property data to be inserted
2. sequence<DbDatum> - several property data to be inserted
3. dict<str, dict<str, obj>> keys are attribute names and value being another dictionary which keys are the attribute property names and the value associated with each key being:

   3.1 seq<str> 3.2 PyTango.DbDatum

Return None

Throws `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device (DB_SQLError)

put_device_property(*self*, *dev_name*, *value*) → None

Insert or update a list of properties for the specified device.

Parameters

dev_name (`str`) object name

value can be one of the following:

1. DbDatum - single property data to be inserted
2. DbData - several property data to be inserted
3. sequence<DbDatum> - several property data to be inserted
4. dict<str, DbDatum> - keys are property names and value has data to be inserted
5. dict<str, obj> - keys are property names and str(obj) is property value
6. dict<str, seq<str>> - keys are property names and value has data to be inserted

Return None

Throws `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device (DB_SQLError)

put_property(*self*, *obj_name*, *value*) → None

Insert or update a list of properties for the specified object.

Parameters

obj_name (`str`) object name

value can be one of the following:

1. DbDatum - single property data to be inserted
2. DbData - several property data to be inserted
3. sequence<DbDatum> - several property data to be inserted
4. dict<str, DbDatum> - keys are property names and value has data to be inserted
5. dict<str, obj> - keys are property names and str(obj) is property value
6. dict<str, seq<str>> - keys are property names and value has data to be inserted

Return None

Throws `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device (DB_SQLError)

put_server_info(*self*, *info*) → None

Add/update server information in the database.

Parameters

info (`DbServerInfo`) new server information

Return None

Throws `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device (DB_SQLError)

New in PyTango 3.0.4

`register_service`(*self, serv_name, inst_name, dev_name*) → None

Register the specified service wihtin the database.

Parameters

serv_name (`str`) service name

inst_name (`str`) instance name

dev_name (`str`) device name

Return None

New in PyTango 3.0.4

`rename_server`(*self, old_ds_name, new_ds_name*) → None

Rename a device server process.

Parameters

old_ds_name (`str`) old name

new_ds_name (`str`) new name

Return None

Throws `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device (DB_SQLError)

New in PyTango 8.1.0

`reread_filedatabase`(*self*) → None

Force a complete refresh over the database if using a file based database.

Parameters None

Return None

New in PyTango 7.0.0

`set_access_checked`(*self, val*) → None

Sets or unsets the control access check.

Parameters

val (`bool`) True to set or False to unset the access control

Return None

New in PyTango 7.0.0

`unexport_device`(*self, dev_name*) → None

Mark the specified device as unexported in the database

Example

```
db.unexport_device('my/own/device')
```

Parameters

dev_name (`str`) device name

Return None

unexport_event (*self*, *event*) → None

Un-export an event from the database.

Parameters

event (`str`) event

Return None

Throws `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device (DB_SQLError)

New in PyTango 7.0.0

unexport_server (*self*, *server*) → None

Mark all devices exported for this server as unexported.

Parameters

server (`str`) name of the server to be unexported with format: <server name>/<instance>

Return None

Throws `ConnectionFailed`, `CommunicationFailed`, `DevFailed` from device (DB_SQLError)

unregister_service (*self*, *serv_name*, *inst_name*) → None

Unregister the specified service from the database.

Parameters

serv_name (`str`) service name

inst_name (`str`) instance name

Return None

New in PyTango 3.0.4

write_filedatabase (*self*) → None

Force a write to the file if using a file based database.

Parameters None

Return None

New in PyTango 7.0.0

class PyTango.**DbDatum**

A single database value which has a name, type, address and value and methods for inserting and extracting C++ native types. This is the fundamental type for specifying database properties. Every property has a name and has one or more values associated with it. A status flag indicates if there is data in the DbDatum object or not. An additional flag allows the user to activate exceptions.

Note: DbDatum is extended to support the python sequence API. This way the DbDatum behaves like a sequence of strings. This allows the user to work with a DbDatum as if it was working with the old list of strings.

New in PyTango 7.0.0

is_empty (*self*) → bool

Returns True or False depending on whether the DbDatum object contains data or not. It can be used to test whether a property is defined in the database or not.

Parameters None

Return (`bool`) True if no data or False otherwise.

New in PyTango 7.0.0

`size`(*self*) → int

Returns the number of separate elements in the value.

Parameters None

Return the number of separate elements in the value.

New in PyTango 7.0.0

class `PyTango.`**`DbDevExportInfo`**

import info for a device (should be retrived from the database) with the following members:
- name : (`str`) device name
- ior : (`str`) CORBA reference of the device
- host : name of the computer hosting the server
- version : (`str`) version
- pid : process identifier

class `PyTango.`**`DbDevExportInfo`**

import info for a device (should be retrived from the database) with the following members:
- name : (`str`) device name
- ior : (`str`) CORBA reference of the device
- host : name of the computer hosting the server
- version : (`str`) version
- pid : process identifier

class `PyTango.`**`DbDevImportInfo`**

import info for a device (should be retrived from the database) with the following members:
- name : (`str`) device name
- exported : 1 if device is running, 0 else
- ior : (str)CORBA reference of the device
- version : (`str`) version

class `PyTango.`**`DbDevInfo`**

A structure containing available information for a device with the following members:
- name : (`str`) name
- _class : (`str`) device class
- server : (`str`) server

class `PyTango.`**`DbHistory`**

A structure containing the modifications of a property. No public members.

`get_attribute_name`(*self*) → str

Returns the attribute name (empty for object properties or device properties)

Parameters None

Return (`str`) attribute name

`get_date`(*self*) → str

Returns the update date

Parameters None

Return (`str`) update date

`get_name`(*self*) → str

Returns the property name.

Parameters None

Return (`str`) property name

`get_value`(*self*) → DbDatum

Returns a COPY of the property value

Parameters None

Return (`DbDatum`) a COPY of the property value

`is_deleted`(*self*) → bool

Returns True if the property has been deleted or False otherwise

Parameters None

Return (`bool`) True if the property has been deleted or False otherwise

class `PyTango.`**`DbServerInfo`**

A structure containing available information for a device server with the following members:

- name : (`str`) name
- host : (`str`) host
- mode : (`str`) mode
- level : (`str`) level

5.5 Encoded API

This feature is only possible since PyTango 7.1.4

class `PyTango.`**`EncodedAttribute`**

`decode_gray16`(*da, extract_as=PyTango._PyTango.ExtractAs.Numpy*)

Decode a 16 bits grayscale image (GRAY16) and returns a 16 bits gray scale image.

param da `DeviceAttribute` that contains the image

type da `DeviceAttribute`

param extract_as defaults to ExtractAs.Numpy

type extract_as ExtractAs

return the decoded data

- **In case String string is choosen as extract method, a tuple is returned:** width<int>, height<int>, buffer<str>
- In case Numpy is choosen as extract method, a `numpy.ndarray` is returned with ndim=2, shape=(height, width) and dtype=numpy.uint16.
- In case Tuple or List are choosen, a tuple<tuple<int>> or list<list<int>> is returned.

Warning: The PyTango calls that return a `DeviceAttribute` (like `DeviceProxy.read_attribute()` or `DeviceProxy.command_inout()`) automatically extract the contents by default. This method requires that the given `DeviceAttribute` is obtained from a call which **DOESN'T** extract the contents. Example:

```
dev = PyTango.DeviceProxy("a/b/c")
da = dev.read_attribute("my_attr", extract_as=PyTango.ExtractAs.Nothing)
enc = PyTango.EncodedAttribute()
data = enc.decode_gray16(da)
```

decode_gray8(*da, extract_as=PyTango._PyTango.ExtractAs.Numpy*)

Decode a 8 bits grayscale image (JPEG_GRAY8 or GRAY8) and returns a 8 bits gray scale image.

param da `DeviceAttribute` that contains the image

type da `DeviceAttribute`

param extract_as defaults to ExtractAs.Numpy

type extract_as ExtractAs

return the decoded data

- **In case String string is choosen as extract method, a tuple is returned:** width<int>, height<int>, buffer<str>
- In case Numpy is choosen as extract method, a `numpy.ndarray` is returned with ndim=2, shape=(height, width) and dtype=numpy.uint8.
- In case Tuple or List are choosen, a tuple<tuple<int>> or list<list<int>> is returned.

Warning: The PyTango calls that return a `DeviceAttribute` (like `DeviceProxy.read_attribute()` or `DeviceProxy.command_inout()`) automatically extract the contents by default. This method requires that the given `DeviceAttribute` is obtained from a call which **DOESN'T** extract the contents. Example:

```
dev = PyTango.DeviceProxy("a/b/c")
da = dev.read_attribute("my_attr", extract_as=PyTango.ExtractAs.Nothing)
enc = PyTango.EncodedAttribute()
data = enc.decode_gray8(da)
```

decode_rgb32(*da, extract_as=PyTango._PyTango.ExtractAs.Numpy*)

Decode a color image (JPEG_RGB or RGB24) and returns a 32 bits RGB image.

param da `DeviceAttribute` that contains the image

type da `DeviceAttribute`

param extract_as defaults to ExtractAs.Numpy

type extract_as ExtractAs

return the decoded data

- **In case String string is choosen as extract method, a tuple is returned:** width<int>, height<int>, buffer<str>

- In case Numpy is choosen as extract method, a `numpy.ndarray` is returned with ndim=2, shape=(height, width) and dtype=numpy.uint32.
- In case Tuple or List are choosen, a tuple<tuple<int>> or list<list<int>> is returned.

Warning: The PyTango calls that return a `DeviceAttribute` (like `DeviceProxy.read_attribute()` or `DeviceProxy.command_inout()`) automatically extract the contents by default. This method requires that the given `DeviceAttribute` is obtained from a call which **DOESN'T** extract the contents. Example:

```
dev = PyTango.DeviceProxy("a/b/c")
da = dev.read_attribute("my_attr", extract_as=PyTango.ExtractAs.Nothing)
enc = PyTango.EncodedAttribute()
data = enc.decode_rgb32(da)
```

encode_gray16 (*gray16, width=0, height=0*)
Encode a 16 bit grayscale image (no compression)

param gray16 an object containning image information

type gray16 `str` or `buffer` or `numpy.ndarray` or seq< seq<element> >

param width image width. **MUST** be given if gray16 is a string or if it is a `numpy.ndarray` with ndims != 2. Otherwise it is calculated internally.

type width `int`

param height image height. **MUST** be given if gray16 is a string or if it is a `numpy.ndarray` with ndims != 2. Otherwise it is calculated internally.

type height `int`

Note: When `numpy.ndarray` is given:

- gray16 **MUST** be CONTIGUOUS, ALIGNED
- if gray16.ndims != 2, width and height **MUST** be given and gray16.nbytes/2 **MUST** match width*height
- if gray16.ndims == 2, gray16.itemsize **MUST** be 2 (typically, gray16.dtype is one of *numpy.dtype.int16*, *numpy.dtype.uint16*, *numpy.dtype.short* or *numpy.dtype.ushort*)

Example :

```
def read_myattr(self, attr):
    enc = PyTango.EncodedAttribute()
    data = numpy.arange(100, dtype=numpy.int16)
    data = numpy.array((data,data,data))
    enc.encode_gray16(data)
    attr.set_value(enc)
```

encode_gray8 (*gray8, width=0, height=0*)
Encode a 8 bit grayscale image (no compression)

param gray8 an object containning image information

type gray8 `str` or `numpy.ndarray` or seq< seq<element> >

param width image width. **MUST** be given if gray8 is a string or if it is a `numpy.ndarray` with ndims != 2. Otherwise it is calculated internally.

type width `int`

param height image height. **MUST** be given if gray8 is a string or if it is a `numpy.ndarray` with ndims != 2. Otherwise it is calculated internally.

type height `int`

Note: When `numpy.ndarray` is given:

- gray8 **MUST** be CONTIGUOUS, ALIGNED
- if gray8.ndims != 2, width and height **MUST** be given and gray8.nbytes **MUST** match width*height
- if gray8.ndims == 2, gray8.itemsize **MUST** be 1 (typically, gray8.dtype is one of *numpy.dtype.byte*, *numpy.dtype.ubyte*, *numpy.dtype.int8* or *numpy.dtype.uint8*)

Example :

```
def read_myattr(self, attr):
    enc = PyTango.EncodedAttribute()
    data = numpy.arange(100, dtype=numpy.byte)
    data = numpy.array((data,data,data))
    enc.encode_gray8(data)
    attr.set_value(enc)
```

encode_jpeg_gray8 (*gray8, width=0, height=0, quality=100.0*)
Encode a 8 bit grayscale image as JPEG format

param gray8 an object containning image information

type gray8 `str` or `numpy.ndarray` or seq< seq<element> >

param width image width. **MUST** be given if gray8 is a string or if it is a `numpy.ndarray` with ndims != 2. Otherwise it is calculated internally.

type width `int`

param height image height. **MUST** be given if gray8 is a string or if it is a `numpy.ndarray` with ndims != 2. Otherwise it is calculated internally.

type height `int`

param quality Quality of JPEG (0=poor quality 100=max quality) (default is 100.0)

type quality `float`

Note: When `numpy.ndarray` is given:

- gray8 **MUST** be CONTIGUOUS, ALIGNED
- if gray8.ndims != 2, width and height **MUST** be given and gray8.nbytes **MUST** match width*height
- if gray8.ndims == 2, gray8.itemsize **MUST** be 1 (typically, gray8.dtype is one of *numpy.dtype.byte*, *numpy.dtype.ubyte*, *numpy.dtype.int8* or *numpy.dtype.uint8*)

Example :

```python
def read_myattr(self, attr):
    enc = PyTango.EncodedAttribute()
    data = numpy.arange(100, dtype=numpy.byte)
    data = numpy.array((data,data,data))
    enc.encode_jpeg_gray8(data)
    attr.set_value(enc)
```

encode_jpeg_rgb24(*rgb24, width=0, height=0, quality=100.0*)
Encode a 24 bit rgb color image as JPEG format.

param rgb24 an object containning image information

type rgb24 `str` or `numpy.ndarray` or seq< seq<element> >

param width image width. **MUST** be given if rgb24 is a string or if it is a `numpy.ndarray` with ndims != 3. Otherwise it is calculated internally.

type width `int`

param height image height. **MUST** be given if rgb24 is a string or if it is a `numpy.ndarray` with ndims != 3. Otherwise it is calculated internally.

type height `int`

param quality Quality of JPEG (0=poor quality 100=max quality) (default is 100.0)

type quality `float`

Note: When `numpy.ndarray` is given:

- rgb24 **MUST** be CONTIGUOUS, ALIGNED
- if rgb24.ndims != 3, width and height **MUST** be given and rgb24.nbytes/3 **MUST** match width*height
- if rgb24.ndims == 3, rgb24.itemsize **MUST** be 1 (typically, rgb24.dtype is one of *numpy.dtype.byte*, *numpy.dtype.ubyte*, *numpy.dtype.int8* or *numpy.dtype.uint8*) and shape **MUST** be (height, width, 3)

Example :

```python
def read_myattr(self, attr):
    enc = PyTango.EncodedAttribute()
    # create an 'image' where each pixel is R=0x01, G=0x01, B=0x01
    arr = numpy.ones((10,10,3), dtype=numpy.uint8)
    enc.encode_jpeg_rgb24(data)
    attr.set_value(enc)
```

encode_jpeg_rgb32(*rgb32, width=0, height=0, quality=100.0*)
Encode a 32 bit rgb color image as JPEG format.

param rgb32 an object containning image information

type rgb32 `str` or `numpy.ndarray` or seq< seq<element> >

param width image width. **MUST** be given if rgb32 is a string or if it is a `numpy.ndarray` with ndims != 2. Otherwise it is calculated internally.

type width `int`

param height image height. **MUST** be given if rgb32 is a string or if it is a `numpy.ndarray` with ndims != 2. Otherwise it is calculated internally.

type height `int`

Note: When `numpy.ndarray` is given:

- rgb32 **MUST** be CONTIGUOUS, ALIGNED
- if rgb32.ndims != 2, width and height **MUST** be given and rgb32.nbytes/4 **MUST** match width*height
- if rgb32.ndims == 2, rgb32.itemsize **MUST** be 4 (typically, rgb32.dtype is one of *numpy.dtype.int32*, *numpy.dtype.uint32*)

Example :

```
def read_myattr(self, attr):
    enc = PyTango.EncodedAttribute()
    data = numpy.arange(100, dtype=numpy.int32)
    data = numpy.array((data,data,data))
    enc.encode_jpeg_rgb32(data)
    attr.set_value(enc)
```

encode_rgb24 (*rgb24, width=0, height=0*)

Encode a 24 bit color image (no compression)

param rgb24 an object containning image information

type rgb24 `str` or `numpy.ndarray` or seq< seq<element> >

param width image width. **MUST** be given if rgb24 is a string or if it is a `numpy.ndarray` with ndims != 3. Otherwise it is calculated internally.

type width `int`

param height image height. **MUST** be given if rgb24 is a string or if it is a `numpy.ndarray` with ndims != 3. Otherwise it is calculated internally.

type height `int`

Note: When `numpy.ndarray` is given:

- rgb24 **MUST** be CONTIGUOUS, ALIGNED
- if rgb24.ndims != 3, width and height **MUST** be given and rgb24.nbytes/3 **MUST** match width*height
- if rgb24.ndims == 3, rgb24.itemsize **MUST** be 1 (typically, rgb24.dtype is one of *numpy.dtype.byte*, *numpy.dtype.ubyte*, *numpy.dtype.int8* or *numpy.dtype.uint8*) and shape **MUST** be (height, width, 3)

Example :

```
def read_myattr(self, attr):
    enc = PyTango.EncodedAttribute()
    # create an 'image' where each pixel is R=0x01, G=0x01, B=0x01
    arr = numpy.ones((10,10,3), dtype=numpy.uint8)
    enc.encode_rgb24(data)
    attr.set_value(enc)
```

5.6 The Utilities API

class `PyTango.utils.`**`EventCallBack`**(*format='{date} {dev_name} {name} {type} {value}', fd=<open file '<stdout>', mode 'w' at 0x7f71b2ae91e0>, max_buf=100*)

Useful event callback for test purposes

Usage:

```
>>> dev = PyTango.DeviceProxy(dev_name)
>>> cb = PyTango.utils.EventCallBack()
>>> id = dev.subscribe_event("state", PyTango.EventType.CHANGE_EVENT, cb, [])
2011-04-06 15:33:18.910474 sys/tg_test/1 STATE CHANGE [ATTR_VALID] ON
```

Allowed format keys are:

- date (event timestamp)
- reception_date (event reception timestamp)
- type (event type)
- dev_name (device name)
- name (attribute name)
- value (event value)

New in PyTango 7.1.4

`get_events`()

Returns the list of events received by this callback

Returns the list of events received by this callback

Return type sequence<obj>

`push_event`(*evt*)

Internal usage only

`PyTango.utils.`**`is_pure_str`**(*obj*)

Tells if the given object is a python string.

In python 2.x this means any subclass of basestring. In python 3.x this means any subclass of str.

Parameters **`obj`** (`object`) – the object to be inspected

Returns True is the given obj is a string or False otherwise

Return type `bool`

`PyTango.utils.`**`is_seq`**(*obj*)

Tells if the given object is a python sequence.

It will return True for any collections.Sequence (list, tuple, str, bytes, unicode), bytearray and (if numpy is enabled) numpy.ndarray

Parameters **`obj`** (`object`) – the object to be inspected

Returns True is the given obj is a sequence or False otherwise

Return type `bool`

`PyTango.utils.`**`is_non_str_seq`**(*obj*)

Tells if the given object is a python sequence (excluding string sequences).

It will return True for any collections.Sequence (list, tuple (and bytes in python3)), bytearray and (if numpy is enabled) numpy.ndarray

Parameters **`obj`** (`object`) – the object to be inspected

Returns True is the given obj is a sequence or False otherwise

Return type `bool`

`PyTango.utils.`**`is_integer`**(*obj*)

Tells if the given object is a python integer.

It will return True for any int, long (in python 2) and (if numpy is enabled) numpy.integer

Parameters **`obj`** (`object`) – the object to be inspected

Returns True is the given obj is a python integer or False otherwise

Return type `bool`

`PyTango.utils.`**`is_number`**(*obj*)

Tells if the given object is a python number.

It will return True for any numbers.Number and (if numpy is enabled) numpy.number

Parameters **`obj`** (`object`) – the object to be inspected

Returns True is the given obj is a python number or False otherwise

Return type `bool`

`PyTango.utils.`**`is_bool`**(*tg_type*, *inc_array=False*)

Tells if the given tango type is boolean

Parameters

- **`tg_type`** (`PyTango.CmdArgType`) – tango type
- **`inc_array`** (`bool`) – (optional, default is False) determines if include array in the list of checked types

Returns True if the given tango type is boolean or False otherwise

Return type `bool`

`PyTango.utils.`**`is_scalar_type`**(*tg_type*)

Tells if the given tango type is a scalar

Parameters **`tg_type`** (`PyTango.CmdArgType`) – tango type

Returns True if the given tango type is a scalar or False otherwise

Return type `bool`

`PyTango.utils.`**`is_array_type`**(*tg_type*)

Tells if the given tango type is an array type

Parameters **`tg_type`** (`PyTango.CmdArgType`) – tango type

Returns True if the given tango type is an array type or False otherwise

Return type `bool`

`PyTango.utils.`**`is_numerical_type`**(*tg_type*, *inc_array=False*)

Tells if the given tango type is numerical

Parameters

- **`tg_type`** (`PyTango.CmdArgType`) – tango type
- **`inc_array`** (`bool`) – (optional, default is False) determines if include array in the list of checked types

Returns True if the given tango type is a numerical or False otherwise

Return type `bool`

`PyTango.utils.`**`is_int_type`**(*tg_type*, *inc_array=False*)

Tells if the given tango type is integer

Parameters

- **`tg_type`** (`PyTango.CmdArgType`) – tango type
- **`inc_array`** (`bool`) – (optional, default is False) determines if include array in the list of checked types

Returns True if the given tango type is integer or False otherwise

Return type `bool`

`PyTango.utils.`**`is_float_type`**(*tg_type*, *inc_array=False*)

Tells if the given tango type is float

Parameters

- **`tg_type`** (`PyTango.CmdArgType`) – tango type
- **`inc_array`** (`bool`) – (optional, default is False) determines if include array in the list of checked types

Returns True if the given tango type is float or False otherwise

Return type `bool`

`PyTango.utils.`**`is_bool_type`**(*tg_type*, *inc_array=False*)

Tells if the given tango type is boolean

Parameters

- **`tg_type`** (`PyTango.CmdArgType`) – tango type
- **`inc_array`** (`bool`) – (optional, default is False) determines if include array in the list of checked types

Returns True if the given tango type is boolean or False otherwise

Return type `bool`

`PyTango.utils.`**`is_bin_type`**(*tg_type*, *inc_array=False*)

Tells if the given tango type is binary

Parameters

- **`tg_type`** (`PyTango.CmdArgType`) – tango type
- **`inc_array`** (`bool`) – (optional, default is False) determines if include array in the list of checked types

Returns True if the given tango type is binary or False otherwise

Return type `bool`

`PyTango.utils.`**`is_str_type`**(*tg_type*, *inc_array=False*)

Tells if the given tango type is string

Parameters

- **`tg_type`** (`PyTango.CmdArgType`) – tango type
- **`inc_array`** (`bool`) – (optional, default is False) determines if include array in the list of checked types

Returns True if the given tango type is string or False otherwise

Return type `bool`

`PyTango.utils.`**`obj_2_str`**(*obj*, *tg_type=None*)

Converts a python object into a string according to the given tango type

Parameters

- **`obj`** (`object`) – the object to be converted
- **`tg_type`** (`PyTango.CmdArgType`) – tango type

Returns a string representation of the given object

Return type `str`

`PyTango.utils.`**`seqStr_2_obj`**(*seq*, *tg_type*, *tg_format=None*)

Translates a sequence<str> to a sequence of objects of give type and format

Parameters

- **`seq`** (*sequence<str>*) – the sequence
- **`tg_type`** (`PyTango.CmdArgType`) – tango type
- **`tg_format`** (`PyTango.AttrDataFormat`) – (optional, default is None, meaning SCALAR) tango format

Returns a new sequence

`PyTango.utils.`**`scalar_to_array_type`**(*tg_type*)

Gives the array tango type corresponding to the given tango scalar type. Example: giving DevLong will return DevVarLongArray.

Parameters **`tg_type`** (`PyTango.CmdArgType`) – tango type

Returns the array tango type for the given scalar tango type

Return type `PyTango.CmdArgType`

Raises ValueError in case the given dtype is not a tango scalar type

`PyTango.utils.`**`get_home`**()

Find user's home directory if possible. Otherwise raise error.

Returns user's home directory

Return type `str`

New in PyTango 7.1.4

`PyTango.utils.`**`requires_pytango`**(*min_version=None*, *conflicts=()*, *software_name='Software'*)

Determines if the required PyTango version for the running software is present. If not an exception is thrown. Example usage:

```
from PyTango import requires_pytango

requires_pytango('7.1', conflicts=['8.1.1'], software='MyDS')
```

Parameters

- **`min_version`** (None, str, `LooseVersion`) – minimum PyTango version [default: None, meaning no minimum required]. If a string is given, it must be in the valid version number format (see: `LooseVersion`)
- **`conflics`** (*seq<str | LooseVersion>*) – a sequence of PyTango versions which conflict with the software using it
- **`software_name`** (*str*) – software name using PyTango. Used in the exception message

Raises Exception if the required PyTango version is not met

New in PyTango 8.1.4

`PyTango.utils.`**`requires_tango`**(*min_version=None*, *conflicts=()*, *software_name='Software'*)

Determines if the required Tango version for the running software is present. If not an exception is thrown. Example usage:

```
from Tango import requires_tango

requires_tango('7.1', conflicts=['8.1.1'], software='MyDS')
```

Parameters

- **`min_version`** (None, str, `LooseVersion`) – minimum Tango version [default: None, meaning no minimum required]. If a string is given, it must be in the valid version number format (see: `LooseVersion`)
- **`conflics`** (*seq<str|LooseVersion>*) – a sequence of Tango versions which conflict with the software using it
- **`software_name`** (*str*) – software name using Tango. Used in the exception message

Raises Exception if the required Tango version is not met

New in PyTango 8.1.4

5.7 Exception API

5.7.1 Exception definition

All the exceptions that can be thrown by the underlying Tango C++ API are available in the PyTango python module. Hence a user can catch one of the following exceptions:

- `DevFailed`
- `ConnectionFailed`
- `CommunicationFailed`
- `WrongNameSyntax`
- `NonDbDevice`
- `WrongData`
- `NonSupportedFeature`
- `AsynCall`
- `AsynReplyNotArrived`
- `EventSystemFailed`
- `NamedDevFailedList`
- `DeviceUnlocked`

When an exception is caught, the sys.exc_info() function returns a tuple of three values that give information about the exception that is currently being handled. The values returned are (type, value, traceback). Since most functions don't need access to the traceback, the best solution is to use something like exctype, value = sys.exc_info()[:2] to extract only the exception type and value. If one of the Tango exceptions is caught, the exctype will be class name of the exception (DevFailed, .. etc) and the value a tuple of dictionary objects all of which containing the following kind of key-value pairs:

- **reason**: a string describing the error type (more readable than the associated error code)
- **desc**: a string describing in plain text the reason of the error.
- **origin**: a string giving the name of the (C++ API) method which thrown the exception
- **severity**: one of the strings WARN, ERR, PANIC giving severity level of the error.

```python
import PyTango

#  How to protect the script from exceptions raised by the Tango
try:
    # Get proxy on a non existing device should throw an exception
    device = DeviceProxy("non/existing/device")
except DevFailed as df:
    print("Failed to create proxy to non/existing/device:\n%s" % df)
```

5.7.2 Throwing exception in a device server

The C++ `PyTango::Except` class with its most important methods have been wrapped to Python. Therefore, in a Python device server, you have the following methods to throw, re-throw or print a Tango::DevFailed exception :

- `throw_exception()` which is a static method
- `re_throw_exception()` which is also a static method
- `print_exception()` which is also a static method

The following code is an example of a command method requesting a command on a sub-device and re-throwing the exception in case of:

```python
1  try:
2      dev.command_inout("SubDevCommand")
3  except PyTango.DevFailed as df:
4      PyTango.Except.re_throw_exception(df,
5          "MyClass_CommandFailed",
6          "Sub device command SubdevCommand failed",
7          "Command()")
```

line 2 Send the command to the sub device in a try/catch block

line 4-6 Re-throw the exception and add a new level of information in the exception stack

5.7.3 Exception API

class `PyTango.`**`Except`**

Bases: `Boost.Python.instance`

A containner for the static methods:

- throw_exception
- re_throw_exception
- print_exception
- compare_exception

static **`print_error_stack`**`(`*ex*`)` → None

Print all the details of a TANGO error stack.

Parameters

ex (`PyTango.DevErrorList`) The error stack reference

static **`print_exception`**`(`*ex*`)` → None

Print all the details of a TANGO exception.

Parameters

ex (`PyTango.DevFailed`) The `DevFailed` exception

static **`re_throw_exception`**(*ex*, *reason*, *desc*, *origin*, *sever=PyTango.ErrSeverity.ERR*) → None

Re-throw a TANGO `DevFailed` exception with one more error. The exception is re-thrown with one more `DevError` object. A default value *PyTango.ErrSeverity.ERR* is defined for the new `DevError` severity field.

Parameters

ex (`PyTango.DevFailed`) The `DevFailed` exception

reason (`str`) The exception `DevError` object reason field

desc (`str`) The exception `DevError` object desc field

origin (`str`) The exception `DevError` object origin field

sever (`PyTango.ErrSeverity`) The exception DevError object severity field

Throws `DevFailed`

static **`throw_exception`**(*reason*, *desc*, *origin*, *sever=PyTango.ErrSeverity.ERR*) → None

Generate and throw a TANGO DevFailed exception. The exception is created with a single `DevError` object. A default value *PyTango.ErrSeverity.ERR* is defined for the `DevError` severity field.

Parameters

reason (`str`) The exception `DevError` object reason field

desc (`str`) The exception `DevError` object desc field

origin (`str`) The exception `DevError` object origin field

sever (`PyTango.ErrSeverity`) The exception DevError object severity field

Throws `DevFailed`

static **`throw_python_exception`**(*type*, *value*, *traceback*) → None

Generate and throw a TANGO DevFailed exception. The exception is created with a single `DevError` object. A default value *PyTango.ErrSeverity.ERR* is defined for the `DevError` severity field.

The parameters are the same as the ones generates by a call to `sys.exc_info()`.

Parameters

type (`class`) the exception type of the exception being handled

value (`object`) exception parameter (its associated value or the second argument to raise, which is always a class instance if the exception type is a class object)

traceback (`traceback`) traceback object

Throws `DevFailed`

New in PyTango 7.2.1

static **`to_dev_failed`**(*exc_type*, *exc_value*, *traceback*) → PyTango.DevFailed

Generate a TANGO DevFailed exception. The exception is created with a single `DevError` object. A default value *PyTango.ErrSeverity.ERR* is defined for the `DevError` severity field.

The parameters are the same as the ones generates by a call to `sys.exc_info()`.

Parameters

type (`class`) the exception type of the exception being handled

value (`object`) exception parameter (its associated value or the second argument to raise, which is always a class instance if the exception type is a class object)

traceback (`traceback`) traceback object

Return (`PyTango.DevFailed`) a tango exception object

New in PyTango 7.2.1

class `PyTango.`**`DevError`**

Bases: `Boost.Python.instance`

Structure describing any error resulting from a command execution, or an attribute query, with following members:

- reason : (`str`) reason
- severity : (`ErrSeverity`) error severty (WARN, ERR, PANIC)
- desc : (`str`) error description
- origin : (`str`) Tango server method in which the error happened

exception `PyTango.`**`DevFailed`**

Bases: `exceptions.Exception`

exception `PyTango.`**`ConnectionFailed`**

Bases: `PyTango.DevFailed`

This exception is thrown when a problem occurs during the connection establishment between the application and the device. The API is stateless. This means that DeviceProxy constructors filter most of the exception except for cases described in the following table.

The desc DevError structure field allows a user to get more precise information. These informations are :

DB_DeviceNotDefined The name of the device not defined in the database

API_CommandFailed The device and command name

API_CantConnectToDevice The device name

API_CorbaException The name of the CORBA exception, its reason, its locality, its completed flag and its minor code

API_CantConnectToDatabase The database server host and its port number

API_DeviceNotExported The device name

exception `PyTango.`**`CommunicationFailed`**

Bases: `PyTango.DevFailed`

This exception is thrown when a communication problem is detected during the communication between the client application and the device server. It is a two levels Tango::DevError structure. In case of time-out, the DevError structures fields are:

Level	Reason	Desc	Severity
0	API_CorbaException	CORBA exception fields translated into a string	ERR
1	API_DeviceTimedOut	String with time-out value and device name	ERR

For all other communication errors, the DevError structures fields are:

Level	Reason	Desc	Severity
0	API_CorbaException	CORBA exception fields translated into a string	ERR
1	API_CommunicationFailed	String with device, method, command/attribute name	ERR

exception `PyTango.`**`WrongNameSyntax`**
Bases: `PyTango.DevFailed`

This exception has only one level of Tango::DevError structure. The possible value for the reason field are :

API_UnsupportedProtocol This error occurs when trying to build a DeviceProxy or an AttributeProxy instance for a device with an unsupported protocol. Refer to the appendix on device naming syntax to get the list of supported database modifier

API_UnsupportedDBaseModifier This error occurs when trying to build a DeviceProxy or an AttributeProxy instance for a device/attribute with a database modifier unsupported. Refer to the appendix on device naming syntax to get the list of supported database modifier

API_WrongDeviceNameSyntax This error occurs for all the other error in device name syntax. It is thrown by the DeviceProxy class constructor.

API_WrongAttributeNameSyntax This error occurs for all the other error in attribute name syntax. It is thrown by the AttributeProxy class constructor.

API_WrongWildcardUsage This error occurs if there is a bad usage of the wildcard character

exception `PyTango.`**`NonDbDevice`**
Bases: `PyTango.DevFailed`

This exception has only one level of Tango::DevError structure. The reason field is set to API_NonDatabaseDevice. This exception is thrown by the API when using the DeviceProxy or AttributeProxy class database access for non-database device.

exception `PyTango.`**`WrongData`**
Bases: `PyTango.DevFailed`

This exception has only one level of Tango::DevError structure. The possible value for the reason field are :

API_EmptyDbDatum This error occurs when trying to extract data from an empty DbDatum object

API_IncompatibleArgumentType This error occurs when trying to extract data with a type different than the type used to send the data

API_EmptyDeviceAttribute This error occurs when trying to extract data from an empty DeviceAttribute object

API_IncompatibleAttrArgumentType This error occurs when trying to extract attribute data with a type different than the type used to send the data

API_EmptyDeviceData This error occurs when trying to extract data from an empty DeviceData object

API_IncompatibleCmdArgumentType This error occurs when trying to extract command data with a type different than the type used to send the data

exception `PyTango.`**`NonSupportedFeature`**

Bases: `PyTango.DevFailed`

This exception is thrown by the API layer when a request to a feature implemented in Tango device interface release n is requested for a device implementing Tango device interface n-x. There is one possible value for the reason field which is API_UnsupportedFeature.

exception `PyTango.`**`AsynCall`**

Bases: `PyTango.DevFailed`

This exception is thrown by the API layer when a the asynchronous model id badly used. This exception has only one level of Tango::DevError structure. The possible value for the reason field are :

API_BadAsynPollId This error occurs when using an asynchronous request identifier which is not valid any more.

API_BadAsyn This error occurs when trying to fire callback when no callback has been previously registered

API_BadAsynReqType This error occurs when trying to get result of an asynchronous request with an asynchronous request identifier returned by a non-coherent asynchronous request (For instance, using the asynchronous request identifier returned by a command_inout_asynch() method with a read_attribute_reply() attribute).

exception `PyTango.`**`AsynReplyNotArrived`**

Bases: `PyTango.DevFailed`

This exception is thrown by the API layer when:

- a request to get asynchronous reply is made and the reply is not yet arrived
- a blocking wait with timeout for asynchronous reply is made and the timeout expired.

There is one possible value for the reason field which is API_AsynReplyNotArrived.

exception `PyTango.`**`EventSystemFailed`**

Bases: `PyTango.DevFailed`

This exception is thrown by the API layer when subscribing or unsubscribing from an event failed. This exception has only one level of Tango::DevError structure. The possible value for the reason field are :

API_NotificationServiceFailed This error occurs when the subscribe_event() method failed trying to access the CORBA notification service

API_EventNotFound This error occurs when you are using an incorrect event_id in the unsubscribe_event() method

API_InvalidArgs This error occurs when NULL pointers are passed to the subscribe or unsubscribe event methods

API_MethodArgument This error occurs when trying to subscribe to an event which has already been subsribed to

API_DSFailedRegisteringEvent This error means that the device server to which the device belongs to failed when it tries to register the event. Most likely, it means that there is no event property defined

API_EventNotFound Occurs when using a wrong event identifier in the unsubscribe_event method

exception `PyTango.`**`DeviceUnlocked`**

Bases: `PyTango.DevFailed`

This exception is thrown by the API layer when a device locked by the process has been unlocked by an admin client. This exception has two levels of Tango::DevError structure. There is only possible value for the reason field which is

API_DeviceUnlocked The device has been unlocked by another client (administration client)

The first level is the message reported by the Tango kernel from the server side. The second layer is added by the client API layer with informations on which API call generates the exception and device name.

exception `PyTango.`**`NotAllowed`**
Bases: `PyTango.DevFailed`

exception `PyTango.`**`NamedDevFailedList`**
Bases: `Boost.Python.instance`

This exception is only thrown by the DeviceProxy::write_attributes() method. In this case, it is necessary to have a new class of exception to transfer the error stack for several attribute(s) which failed during the writing. Therefore, this exception class contains for each attributes which failed :

- The name of the attribute
- Its index in the vector passed as argumen tof the write_attributes() method
- The error stack

CHAPTER

SIX

HOW TO

This is a small list of how-tos specific to PyTango. A more general Tango how-to list can be found here.

6.1 Check the default TANGO host

The default TANGO host can be defined using the environment variable `TANGO_HOST` or in a *tangorc* file (see Tango environment variables for complete information)

To check what is the current value that TANGO uses for the default configuration simple do:

```
>>> import PyTango
>>> PyTango.ApiUtil.get_env_var("TANGO_HOST")
'homer.simpson.com:10000'
```

6.2 Check TANGO version

There are two library versions you might be interested in checking: The PyTango version:

```
>>> import PyTango
>>> PyTango.__version__
'8.1.1'

>>> PyTango.__version_info__
(8, 1, 1, 'final', 0)
```

... and the Tango C++ library version that PyTango was compiled with:

```
>>> import PyTango
>>> PyTango.constants.TgLibVers
'8.1.2'
```

6.3 Report a bug

Bugs can be reported as tickets in TANGO Source forge.

When making a bug report don't forget to select *PyTango* in **Category**.

It is also helpfull if you can put in the ticket description the PyTango information. It can be a dump of:

```
$ python -c "from PyTango.utils import info; print(info())"
```

6.4 Test the connection to the Device and get it's current state

One of the most basic examples is to get a reference to a device and determine if it is running or not:

```python
from PyTango import DeviceProxy

# Get proxy on the tango_test1 device
print("Creating proxy to TangoTest device...")
tango_test = DeviceProxy("sys/tg_test/1")

# ping it
print(tango_test.ping())

# get the state
print(tango_test.state())
```

6.5 Read and write attributes

Basic read/write attribute operations:

```python
from PyTango import DeviceProxy

# Get proxy on the tango_test1 device
print("Creating proxy to TangoTest device...")
tango_test = DeviceProxy("sys/tg_test/1")

# Read a scalar attribute. This will return a PyTango.DeviceAttribute
# Member 'value' contains the attribute value
scalar = tango_test.read_attribute("long_scalar")
print("Long_scalar value = {0}".format(scalar.value))

# PyTango provides a shorter way:
scalar = tango_test.long_scalar.value
print("Long_scalar value = {0}".format(scalar))

# Read a spectrum attribute
spectrum = tango_test.read_attribute("double_spectrum")
# ... or, the shorter version:
spectrum = tango_test.double_spectrum

# Write a scalar attribute
scalar_value = 18
tango_test.write_attribute("long_scalar", scalar_value)

#  PyTango provides a shorter way:
tango_test.long_scalar = scalar_value

# Write a spectrum attribute
spectrum_value = [1.2, 3.2, 12.3]
tango_test.write_attribute("double_spectrum", spectrum_value)
# ... or, the shorter version:
tango_test.double_spectrum = spectrum_value
```

```

# Write an image attribute
image_value = [ [1, 2], [3, 4] ]
tango_test.write_attribute("long_image", image_value)
# ... or, the shorter version:
tango_test.long_image = image_value
```

Note that if PyTango is compiled with numpy support the values got when reading a spectrum or an image will be numpy arrays. This results in a faster and more memory efficient PyTango. You can also use numpy to specify the values when writing attributes, especially if you know the exact attribute type:

```
import numpy
from PyTango import DeviceProxy

# Get proxy on the tango_test1 device
print("Creating proxy to TangoTest device...")
tango_test = DeviceProxy("sys/tg_test/1")

data_1d_long = numpy.arange(0, 100, dtype=numpy.int32)

tango_test.long_spectrum = data_1d_long

data_2d_float = numpy.zeros((10,20), dtype=numpy.float64)

tango_test.double_image = data_2d_float
```

6.6 Execute commands

As you can see in the following example, when scalar types are used, the Tango binding automagically manages the data types, and writing scripts is quite easy:

```
from PyTango import DeviceProxy

# Get proxy on the tango_test1 device
print("Creating proxy to TangoTest device...")
tango_test = DeviceProxy("sys/tg_test/1")

# First use the classical command_inout way to execute the DevString command
# (DevString in this case is a command of the Tango_Test device)

result = tango_test.command_inout("DevString", "First hello to device")
print("Result of execution of DevString command = {0}".format(result))

# the same can be achieved with a helper method
result = tango_test.DevString("Second Hello to device")
print("Result of execution of DevString command = {0}".format(result))

# Please note that argin argument type is automatically managed by python
result = tango_test.DevULong(12456)
print("Result of execution of DevULong command = {0}".format(result))
```

6.7 Execute commands with more complex types

In this case you have to use put your arguments data in the correct python structures:

```python
from PyTango import DeviceProxy

# Get proxy on the tango_test1 device
print("Creating proxy to TangoTest device...")
tango_test = DeviceProxy("sys/tg_test/1")

# The input argument is a DevVarLongStringArray so create the argin
# variable containing an array of longs and an array of strings
argin = ([1,2,3], ["Hello", "TangoTest device"])

result = tango_test.DevVarLongArray(argin)
print("Result of execution of DevVarLongArray command = {0}".format(result))
```

6.8 Work with Groups

Todo

write this how to

6.9 Handle errors

Todo

write this how to

For now check *Exception API*.

6.10 Registering devices

Here is how to define devices in the Tango DataBase:

```python
from PyTango import Database, DbDevInfo

#  A reference on the DataBase
db = Database()

# The 3 devices name we want to create
# Note: these 3 devices will be served by the same DServer
new_device_name1 = "px1/tdl/mouse1"
new_device_name2 = "px1/tdl/mouse2"
new_device_name3 = "px1/tdl/mouse3"

# Define the Tango Class served by this  DServer
new_device_info_mouse = DbDevInfo()
new_device_info_mouse._class = "Mouse"
new_device_info_mouse.server = "ds_Mouse/server_mouse"

# add the first device
print("Creating device: %s" % new_device_name1)
new_device_info_mouse.name = new_device_name1
db.add_device(new_device_info_mouse)

```

```python
# add the next device
print("Creating device: %s" % new_device_name2)
new_device_info_mouse.name = new_device_name2
db.add_device(new_device_info_mouse)

# add the third device
print("Creating device: %s" % new_device_name3)
new_device_info_mouse.name = new_device_name3
db.add_device(new_device_info_mouse)
```

6.10.1 Setting up device properties

A more complex example using python subtilities. The following python script example (containing some functions and instructions manipulating a Galil motor axis device server) gives an idea of how the Tango API should be accessed from Python:

```python
from PyTango import DeviceProxy

# connecting to the motor axis device
axis1 = DeviceProxy("microxas/motorisation/galilbox")

# Getting Device Properties
property_names = ["AxisBoxAttachement",
                  "AxisEncoderType",
                  "AxisNumber",
                  "CurrentAcceleration",
                  "CurrentAccuracy",
                  "CurrentBacklash",
                  "CurrentDeceleration",
                  "CurrentDirection",
                  "CurrentMotionAccuracy",
                  "CurrentOvershoot",
                  "CurrentRetry",
                  "CurrentScale",
                  "CurrentSpeed",
                  "CurrentVelocity",
                  "EncoderMotorRatio",
                  "logging_level",
                  "logging_target",
                  "UserEncoderRatio",
                  "UserOffset"]

axis_properties = axis1.get_property(property_names)
for prop in axis_properties.keys():
    print("%s: %s" % (prop, axis_properties[prop][0]))

# Changing Properties
axis_properties["AxisBoxAttachement"] = ["microxas/motorisation/galilbox"]
axis_properties["AxisEncoderType"] = ["1"]
axis_properties["AxisNumber"] = ["6"]
axis1.put_property(axis_properties)
```

6.11 Write a server

Before reading this chapter you should be aware of the TANGO basic concepts. This chapter does not explain what a Tango device or a device server is. This is explained in details in the Tango control system manual

Since version 8.1, PyTango provides a helper module which simplifies the development of a Tango device server. This helper is provided through the `PyTango.server` module.

Here is a simple example on how to write a *Clock* device server using the high level API

```
 1  import time
 2  from PyTango.server import run
 3  from PyTango.server import Device, DeviceMeta
 4  from PyTango.server import attribute, command
 5
 6
 7  class Clock(Device):
 8      __metaclass__ = DeviceMeta
 9
10      @attribute
11      def time(self):
12          return time.time()
13
14      @command(dtype_in=str, dtype_out=str)
15      def strftime(self, format):
16          return time.strftime(format)
17
18
19  if __name__ == "__main__":
20      run([Clock])
```

line 2-4 import the necessary symbols

line 7 tango device class definition. A Tango device must inherit from `PyTango.server.Device`

line 8 mandatory *magic* line. A Tango device must define the metaclass as `PyTango.server.DeviceClass`. This has to be done due to a limitation on boost-python

line 10-12 definition of the *time* attribute. By default, attributes are double, scalar, read-only. Check the `attribute` for the complete list of attribute options.

line 14-16 the method *strftime* is exported as a Tango command. In receives a string as argument and it returns a string. If a method is to be exported as a Tango command, it must be decorated as such with the `command()` decorator

line 20 start the Tango run loop. The mandatory argument is a list of python classes that are to be exported as Tango classes. Check `run()` for the complete list of options

Here is a more complete example on how to write a *PowerSupply* device server using the high level API. The example contains:

1. a read-only double scalar attribute called *voltage*
2. a read/write double scalar expert attribute *current*
3. a read-only double image attribute called *noise*
4. a *ramp* command
5. a *host* device property
6. a *port* class property

```
from time import time
from numpy.random import random_sample

from PyTango import AttrQuality, AttrWriteType, DispLevel, run
from PyTango.server import Device, DeviceMeta, attribute, command
from PyTango.server import class_property, device_property

```

```

class PowerSupply(Device):
    __metaclass__ = DeviceMeta

    current = attribute(label="Current", dtype=float,
                        display_level=DispLevel.EXPERT,
                        access=AttrWriteType.READ_WRITE,
                        unit="A", format="8.4f",
                        min_value=0.0, max_value=8.5,
                        min_alarm=0.1, max_alarm=8.4,
                        min_warning=0.5, max_warning=8.0,
                        fget="get_current", fset="set_current",
                        doc="the power supply current")

    noise = attribute(label="Noise", dtype=((float,),),
                      max_dim_x=1024, max_dim_y=1024,
                      fget="get_noise")

    host = device_property(dtype=str)
    port = class_property(dtype=int, default_value=9788)

    @attribute
    def voltage(self):
        self.info_stream("get voltage(%s, %d)" % (self.host, self.port))
        return 10.0

    def get_current(self):
        return 2.3456, time(), AttrQuality.ATTR_WARNING

    def set_current(self, current):
        print("Current set to %f" % current)

    def get_noise(self):
        return random_sample((1024, 1024))

    @command(dtype_in=float)
    def ramp(self, value):
        print("Ramping up...")


if __name__ == "__main__":
    run([PowerSupply])
```

Note: the `__metaclass__` statement is mandatory due to a limitation in the *boost-python* library used by PyTango.

If you are using python 3 you can write instead:

```
class PowerSupply(Device, metaclass=DeviceMeta)
    pass
```

6.12 Server logging

This chapter instructs you on how to use the tango logging API (log4tango) to create tango log messages on your device server.

The logging system explained here is the Tango Logging Service (TLS). For detailed information on how this logging system works please check:

- 3.5 The tango logging service
- 9.3 The tango logging service

The easiest way to start seeing log messages on your device server console is by starting it with the verbose option. Example:

```
python PyDsExp.py PyDs1 -v4
```

This activates the console tango logging target and filters messages with importance level DEBUG or more. The links above provided detailed information on how to configure log levels and log targets. In this document we will focus on how to write log messages on your device server.

6.12.1 Basic logging

The most basic way to write a log message on your device is to use the `Device` logging related methods:

- `debug_stream()`
- `info_stream()`
- `warn_stream()`
- `error_stream()`
- `fatal_stream()`

Example:

```python
def read_voltage(self):
    self.info_stream("read voltage attribute")
    # ...
    return voltage_value
```

This will print a message like:

```
1282206864 [-1215867200] INFO test/power_supply/1 read voltage attribute
```

every time a client asks to read the *voltage* attribute value.

The logging methods support argument list feature (since PyTango 8.1). Example:

```python
def read_voltage(self):
    self.info_stream("read_voltage(%s, %d)", self.host, self.port)
    # ...
    return voltage_value
```

6.12.2 Logging with print statement

This feature is only possible since PyTango 7.1.3

It is possible to use the print statement to log messages into the tango logging system. This is achieved by using the python's print extend form sometimes refered to as *print chevron*.

Same example as above, but now using *print chevron*:

```python
def read_voltage(self, the_att):
    print >>self.log_info, "read voltage attribute"
    # ...
    return voltage_value
```

Or using the python 3k print function:

```python
def read_Long_attr(self, the_att):
    print("read voltage attribute", file=self.log_info)
    # ...
    return voltage_value
```

6.12.3 Logging with decorators

This feature is only possible since PyTango 7.1.3

PyTango provides a set of decorators that place automatic log messages when you enter and when you leave a python method. For example:

```python
@PyTango.DebugIt()
def read_Long_attr(self, the_att):
    the_att.set_value(self.attr_long)
```

will generate a pair of log messages each time a client asks for the 'Long_attr' value. Your output would look something like:

```
1282208997 [-1215965504] DEBUG test/pydsexp/1 -> read_Long_attr()
1282208997 [-1215965504] DEBUG test/pydsexp/1 <- read_Long_attr()
```

Decorators exist for all tango log levels:

- `PyTango.DebugIt`
- `PyTango.InfoIt`
- `PyTango.WarnIt`
- `PyTango.ErrorIt`
- `PyTango.FatalIt`

The decorators receive three optional arguments:

- show_args - shows method arguments in log message (defaults to False)
- show_kwargs shows keyword method arguments in log message (defaults to False)
- show_ret - shows return value in log message (defaults to False)

Example:

```python
@PyTango.DebugIt(show_args=True, show_ret=True)
def IOLong(self, in_data):
    return in_data * 2
```

will output something like:

```
1282221947 [-1261438096] DEBUG test/pydsexp/1 -> IOLong(23)
1282221947 [-1261438096] DEBUG test/pydsexp/1 46 <- IOLong()
```

6.13 Multiple device classes (Python and C++) in a server

Within the same python interpreter, it is possible to mix several Tango classes. Let's say two of your colleagues programmed two separate Tango classes in two separated python files: A `PLC` class in a `PLC.py`:

```
# PLC.py

from PyTango.server import Device, DeviceMeta, run

class PLC(Device):
    __metaclass__ = DeviceMeta

    # bla, bla my PLC code

if __name__ == "__main__":
    run([PLC])
```

... and a `IRMirror` in a `IRMirror.py`:

```
# IRMirror.py

from PyTango.server import Device, DeviceMeta, run

class IRMirror(Device):
    __metaclass__ = DeviceMeta

    # bla, bla my IRMirror code

if __name__ == "__main__":
    run([IRMirror])
```

You want to create a Tango server called *PLCMirror* that is able to contain devices from both PLC and IRMirror classes. All you have to do is write a `PLCMirror.py` containing the code:

```
# PLCMirror.py

from PyTango.server import run
from PLC import PLC
from IRMirror import IRMirror

run([PLC, IRMirror])
```

It is also possible to add C++ Tango class in a Python device server as soon as:

1. The Tango class is in a shared library
2. It exist a C function to create the Tango class

For a Tango class called MyTgClass, the shared library has to be called MyTgClass.so and has to be in a directory listed in the LD_LIBRARY_PATH environment variable. The C function creating the Tango class has to be called _create_MyTgClass_class() and has to take one parameter of type "char *" which is the Tango class name. Here is an example of the main function of the same device server than before but with one C++ Tango class called SerialLine:

```
1  import PyTango
2  import sys
3
4  if __name__ == '__main__':
5      py = PyTango.Util(sys.argv)
6      util.add_class('SerialLine', 'SerialLine', language="c++")
7      util.add_class(PLCClass, PLC, 'PLC')
8      util.add_class(IRMirrorClass, IRMirror, 'IRMirror')
9
10     U = PyTango.Util.instance()
11     U.server_init()
12     U.server_run()
```

Line 6 The C++ class is registered in the device server

Line 7 and 8 The two Python classes are registered in the device server

6.14 Create attributes dynamically

It is also possible to create dynamic attributes within a Python device server. There are several ways to create dynamic attributes. One of the way, is to create all the devices within a loop, then to create the dynamic attributes and finally to make all the devices available for the external world. In C++ device server, this is typically done within the <Device>Class::device_factory() method. In Python device server, this method is generic and the user does not have one. Nevertheless, this generic device_factory method calls a method named dyn_attr() allowing the user to create his dynamic attributes. It is simply necessary to re-define this method within your <Device>Class and to create the dynamic attribute within this method:

`dyn_attr(self, dev_list)`

where dev_list is a list containing all the devices created by the generic device_factory() method.

There is another point to be noted regarding dynamic attribute within Python device server. The Tango Python device server core checks that for each attribute it exists methods named <attribute_name>_read and/or <attribute_name>_write and/or is_<attribute_name>_allowed. Using dynamic attribute, it is not possible to define these methods because attributes name and number are known only at run-time. To address this issue, the Device_3Impl::add_attribute() method has a diferent signature for Python device server which is:

`add_attribute(self, attr, r_meth = None, w_meth = None, is_allo_meth = None)`

attr is an instance of the Attr class, r_meth is the method which has to be executed with the attribute is read, w_meth is the method to be executed when the attribute is written and is_allo_meth is the method to be executed to implement the attribute state machine. The method passed here as argument as to be class method and not object method. Which argument you have to use depends on the type of the attribute (A WRITE attribute does not need a read method). Note, that depending on the number of argument you pass to this method, you may have to use Python keyword argument. The necessary methods required by the Tango Python device server core will be created automatically as a forward to the methods given as arguments.

Here is an example of a device which has a TANGO command called *createFloatAttribute*. When called, this command creates a new scalar floating point attribute with the specified name:

```python
from PyTango import Util, Attr
from PyTango.server import DeviceMeta, Device, command

class MyDevice(Device):
    __metaclass__ = DeviceMeta

    @command(dtype_in=str)
    def CreateFloatAttribute(self, attr_name):
        attr = Attr(attr_name, PyTango.DevDouble)
        self.add_attribute(attr, self.read_General, self.write_General)

    def read_General(self, attr):
        self.info_stream("Reading attribute %s", attr.get_name())
        attr.set_value(99.99)

    def write_General(self, attr):
        self.info_stream("Writting attribute %s", attr.get_name())
```

6.15 Create/Delete devices dynamically

This feature is only possible since PyTango 7.1.2

Starting from PyTango 7.1.2 it is possible to create devices in a device server "en caliente". This means that you can create a command in your "management device" of a device server that creates devices of (possibly) several other tango classes. There are two ways to create a new device which are described below.

Tango imposes a limitation: the tango class(es) of the device(s) that is(are) to be created must have been registered before the server starts. If you use the high level API, the tango class(es) must be listed in the call to `run()`. If you use the lower level server API, it must be done using individual calls to `add_class()`.

6.15.1 Dynamic device from a known tango class name

If you know the tango class name but you don't have access to the `PyTango.DeviceClass` (or you are too lazy to search how to get it ;-) the way to do it is call `create_device()` / `delete_device()`. Here is an example of implementing a tango command on one of your devices that creates a device of some arbitrary class (the example assumes the tango commands 'CreateDevice' and 'DeleteDevice' receive a parameter of type DevVarStringArray with two strings. No error processing was done on the code for simplicity sake):

```python
from PyTango import Util
from PyTango.server import DeviceMeta, Device, command

class MyDevice(Device):
    __metaclass__ = DeviceMeta

    @command(dtype_in=[str])
    def CreateDevice(self, pars):
        klass_name, dev_name = pars
        util = Util.instance()
        util.create_device(klass_name, dev_name, alias=None, cb=None)

    @command(dtype_in=[str])
    def DeleteDevice(self, pars):
        klass_name, dev_name = pars
        util = Util.instance()
        util.delete_device(klass_name, dev_name)
```

An optional callback can be registered that will be executed after the device is registed in the tango database but before the actual device object is created and its init_device method is called. It can be used, for example, to initialize some device properties.

6.15.2 Dynamic device from a known tango class

If you already have access to the `DeviceClass` object that corresponds to the tango class of the device to be created you can call directly the `create_device()` / `delete_device()`. For example, if you wish to create a clone of your device, you can create a tango command called *Clone*:

```
class MyDevice(PyTango.Device_4Impl):

    def fill_new_device_properties(self, dev_name):
        prop_names = db.get_device_property_list(self.get_name(), "*")
        prop_values = db.get_device_property(self.get_name(), prop_names.value_string)
        db.put_device_property(dev_name, prop_values)

        # do the same for attributes...
        ...

    def Clone(self, dev_name):
        klass = self.get_device_class()
        klass.create_device(dev_name, alias=None, cb=self.fill_new_device_properties)

    def DeleteSibling(self, dev_name):
        klass = self.get_device_class()
        klass.delete_device(dev_name)
```

Note that the cb parameter is optional. In the example it is given for demonstration purposes only.

6.16 Write a server (original API)

This chapter describes how to develop a PyTango device server using the original PyTango server API. This API mimics the C++ API and is considered low level. You should write a server using this API if you are using code generated by Pogo tool or if for some reason the high level API helper doesn't provide a feature you need (in that case think of writing a mail to tango mailing list explaining what you cannot do).

6.16.1 The main part of a Python device server

The rule of this part of a Tango device server is to:

- Create the `Util` object passing it the Python interpreter command line arguments
- Add to this object the list of Tango class(es) which have to be hosted by this interpreter
- Initialize the device server
- Run the device server loop

The following is a typical code for this main function:

```
1  if __name__ == '__main__':
2      util = PyTango.Util(sys.argv)
3      util.add_class(PyDsExpClass, PyDsExp)
4
5      U = PyTango.Util.instance()
6      U.server_init()
7      U.server_run()
```

Line 2 Create the Util object passing it the interpreter command line arguments

Line 3 Add the Tango class *PyDsExp* to the device server. The `Util.add_class()` method of the Util class has two arguments which are the Tango class PyDsExpClass instance and the Tango PyDsExp instance. This `Util.add_class()` method is only available since version 7.1.2. If you are using an older version please use `Util.add_TgClass()` instead.

Line 7 Initialize the Tango device server

Line 8 Run the device server loop

6.16.2 The PyDsExpClass class in Python

The rule of this class is to :

- Host and manage data you have only once for the Tango class whatever devices of this class will be created
- Define Tango class command(s)
- Define Tango class attribute(s)

In our example, the code of this Python class looks like:

```
1  class PyDsExpClass(PyTango.DeviceClass):
2
3      cmd_list = { 'IOLong' : [ [ PyTango.ArgType.DevLong, "Number" ],
4                               [ PyTango.ArgType.DevLong, "Number * 2" ] ],
5                   'IOStringArray' : [ [ PyTango.ArgType.DevVarStringArray, "Array of string" ],
6                                       [ PyTango.ArgType.DevVarStringArray, "This reversed array"]
7      }
8
9      attr_list = { 'Long_attr' : [ [ PyTango.ArgType.DevLong ,
10                                     PyTango.AttrDataFormat.SCALAR ,
11                                     PyTango.AttrWriteType.READ],
12                                   { 'min alarm' : 1000, 'max alarm' : 1500 } ],
13
14                   'Short_attr_rw' : [ [ PyTango.ArgType.DevShort,
15                                         PyTango.AttrDataFormat.SCALAR,
16                                         PyTango.AttrWriteType.READ_WRITE ] ]
17     }
```

Line 1 The PyDsExpClass class has to inherit from the `DeviceClass` class

Line 3 to 7 Definition of the cmd_list `dict` defining commands. The *IOLong* command is defined at lines 3 and 4. The *IOStringArray* command is defined in lines 5 and 6

Line 9 to 17 Definition of the attr_list `dict` defining attributes. The *Long_attr* attribute is defined at lines 9 to 12 and the *Short_attr_rw* attribute is defined at lines 14 to 16

If you have something specific to do in the class constructor like initializing some specific data member, you will have to code a class constructor. An example of such a contructor is

```
1  def __init__(self, name):
2      PyTango.DeviceClass.__init__(self, name)
3      self.set_type("TestDevice")
```

The device type is set at line 3.

6.16.3 Defining commands

As shown in the previous example, commands have to be defined in a `dict` called *cmd_list* as a data member of the xxxClass class of the Tango class. This `dict` has one element per command. The element key is the command name. The element value is a python list which defines the command. The generic form of a command definition is:

```
'cmd_name' :  [ [in_type, <"In desc">], [out_type, <"Out desc">],
<{opt parameters}>]
```

The first element of the value list is itself a list with the command input data type (one of the `PyTango.ArgType` pseudo enumeration value) and optionally a string describing this input argument. The second element of the value list is also a list with the command output data type (one of the `PyTango.ArgType` pseudo enumeration value) and optionaly a string describing it. These two elements are mandatory. The third list element is optional and allows additional command definition. The authorized element for this `dict` are summarized in the following array:

key	Value	Definition
"display level"	DispLevel enum value	The command display level
"polling period"	Any number	The command polling period (mS)
"default command"	True or False	To define that it is the default command

6.16.4 Defining attributes

As shown in the previous example, attributes have to be defined in a `dict` called **attr_list** as a data member of the xxxClass class of the Tango class. This `dict` has one element per attribute. The element key is the attribute name. The element value is a python `list` which defines the attribute. The generic form of an attribute definition is:

```
'attr_name' :  [ [mandatory parameters], <{opt parameters}>]
```

For any kind of attributes, the mandatory parameters are:

```
[attr data type, attr data format, attr data R/W type]
```

The attribute data type is one of the possible value for attributes of the `PyTango.ArgType` pseudo enunmeration. The attribute data format is one of the possible value of the `PyTango.AttrDataFormat` pseudo enumeration and the attribute R/W type is one of the possible value of the `PyTango.AttrWriteType` pseudo enumeration. For spectrum attribute, you have to add the maximum X size (a number). For image attribute, you have to add the maximun X and Y dimension (two numbers). The authorized elements for the `dict` defining optional parameters are summarized in the following array:

key	value	definition
“display level”	PyTango.DispLevel enum value	The attribute display level
“polling period”	Any number	The attribute polling period (mS)
“memorized”	“true” or “true_without_hard_applied”	Define if and how the att. is memorized
“label”	A string	The attribute label
“description”	A string	The attribute description
“unit”	A string	The attribute unit
“standard unit”	A number	The attribute standard unit
“display unit”	A string	The attribute display unit
“format”	A string	The attribute display format
“max value”	A number	The attribute max value
“min value”	A number	The attribute min value
“max alarm”	A number	The attribute max alarm
“min alarm”	A number	The attribute min alarm
“min warning”	A number	The attribute min warning
“max warning”	A number	The attribute max warning
“delta time”	A number	The attribute RDS alarm delta time
“delta val”	A number	The attribute RDS alarm delta val

6.16.5 The PyDsExp class in Python

The rule of this class is to implement methods executed by commands and attributes. In our example, the code of this class looks like:

```python
class PyDsExp(PyTango.Device_4Impl):

    def __init__(self,cl,name):
        PyTango.Device_4Impl.__init__(self, cl, name)
        self.info_stream('In PyDsExp.__init__')
        PyDsExp.init_device(self)

    def init_device(self):
        self.info_stream('In Python init_device method')
        self.set_state(PyTango.DevState.ON)
        self.attr_short_rw = 66
        self.attr_long = 1246

    #------------------------------------------------------------------

    def delete_device(self):
        self.info_stream('PyDsExp.delete_device')

    #------------------------------------------------------------------
    # COMMANDS
    #------------------------------------------------------------------

    def is_IOLong_allowed(self):
        return self.get_state() == PyTango.DevState.ON

    def IOLong(self, in_data):
        self.info_stream('IOLong', in_data)
```

```
28         in_data = in_data * 2
29         self.info_stream('IOLong returns', in_data)
30         return in_data
31 
32     #------------------------------------------------------------------
33 
34     def is_IOStringArray_allowed(self):
35         return self.get_state() == PyTango.DevState.ON
36 
37     def IOStringArray(self, in_data):
38         l = range(len(in_data)-1, -1, -1)
39         out_index=0
40         out_data=[]
41         for i in l:
42             self.info_stream('IOStringArray <-', in_data[out_index])
43             out_data.append(in_data[i])
44             self.info_stream('IOStringArray ->',out_data[out_index])
45             out_index += 1
46         self.y = out_data
47         return out_data
48 
49     #------------------------------------------------------------------
50     # ATTRIBUTES
51     #------------------------------------------------------------------
52 
53     def read_attr_hardware(self, data):
54         self.info_stream('In read_attr_hardware')
55 
56     def read_Long_attr(self, the_att):
57         self.info_stream("read_Long_attr")
58 
59         the_att.set_value(self.attr_long)
60 
61     def is_Long_attr_allowed(self, req_type):
62         return self.get_state() in (PyTango.DevState.ON,)
63 
64     def read_Short_attr_rw(self, the_att):
65         self.info_stream("read_Short_attr_rw")
66 
67         the_att.set_value(self.attr_short_rw)
68 
69     def write_Short_attr_rw(self, the_att):
70         self.info_stream("write_Short_attr_rw")
71 
72         self.attr_short_rw = the_att.get_write_value()
73 
74     def is_Short_attr_rw_allowed(self, req_type):
75         return self.get_state() in (PyTango.DevState.ON,)
```

Line 1 The PyDsExp class has to inherit from the PyTango.Device_4Impl

Line 3 to 6 PyDsExp class constructor. Note that at line 6, it calls the *init_device()* method

Line 8 to 12 The init_device() method. It sets the device state (line 9) and initialises some data members

Line 16 to 17 The delete_device() method. This method is not mandatory. You define it only if you have to do something specific before the device is destroyed

Line 23 to 30 The two methods for the *IOLong* command. The first method is called *is_IOLong_allowed()* and it is the command is_allowed method (line 23 to 24). The second method has the same name than the command name. It is the method which executes the command. The command input data type is a Tango long and therefore, this method receives a python integer.

Line 34 to 47 The two methods for the *IOStringArray* command. The first method is its is_allowed method (Line 34 to 35). The second one is the command execution method (Line 37 to 47). The command input data type is a string array. Therefore, the method receives the array in a python list of python strings.

Line 53 to 54 The *read_attr_hardware()* method. Its argument is a Python sequence of Python integer.

Line 56 to 59 The method executed when the *Long_attr* attribute is read. Note that before PyTango 7 it sets the attribute value with the PyTango.set_attribute_value function. Now the same can be done using the set_value of the attribute object

Line 61 to 62 The is_allowed method for the *Long_attr* attribute. This is an optional method that is called when the attribute is read or written. Not defining it has the same effect as always returning True. The parameter req_type is of type `AttReqtype` which tells if the method is called due to a read or write request. Since this is a read-only attribute, the method will only be called for read requests, obviously.

Line 64 to 67 The method executed when the *Short_attr_rw* attribute is read.

Line 69 to 72 The method executed when the Short_attr_rw attribute is written. Note that before PyTango 7 it gets the attribute value with a call to the Attribute method *get_write_value* with a list as argument. Now the write value can be obtained as the return value of the *get_write_value* call. And in case it is a scalar there is no more the need to extract it from the list.

Line 74 to 75 The is_allowed method for the *Short_attr_rw* attribute. This is an optional method that is called when the attribute is read or written. Not defining it has the same effect as always returning True. The parameter req_type is of type `AttReqtype` which tells if the method is called due to a read or write request.

General methods

The following array summarizes how the general methods we have in a Tango device server are implemented in Python.

Name	Input par (with "self")	return value	mandatory
init_device	None	None	Yes
delete_device	None	None	No
always_executed_hook	None	None	No
signal_handler	`int`	None	No
read_attr_hardware	sequence<`int`>	None	No

Implementing a command

Commands are defined as described above. Nevertheless, some methods implementing them have to be written. These methods names are fixed and depend on command name. They have to be called:

- `is_<Cmd_name>_allowed(self)`
- `<Cmd_name>(self, arg)`

For instance, with a command called *MyCmd*, its is_allowed method has to be called *is_MyCmd_allowed* and its execution method has to be called simply *MyCmd*. The following array gives some more info on these methods.

Name	Input par (with "self")	return value	mandatory
is_<Cmd_name>_allowed	None	Python boolean	No
Cmd_name	Depends on cmd type	Depends on cmd type	Yes

Please check *Data types* chapter to understand the data types that can be used in command parameters and return values.

The following code is an example of how you write code executed when a client calls a command named IOLong:

```
1 def is_IOLong_allowed(self):
2     self.debug_stream("in is_IOLong_allowed")
3     return self.get_state() == PyTango.DevState.ON
4 
5 def IOLong(self, in_data):
6     self.info_stream('IOLong', in_data)
7     in_data = in_data * 2
8     self.info_stream('IOLong returns', in_data)
9     return in_data
```

Line 1-3 the is_IOLong_allowed method determines in which conditions the command 'IOLong' can be executed. In this case, the command can only be executed if the device is in 'ON' state.

Line 6 write a log message to the tango INFO stream (click *here* for more information about PyTango log system).

Line 7 does something with the input parameter

Line 8 write another log message to the tango INFO stream (click *here* for more information about PyTango log system).

Line 9 return the output of executing the tango command

Implementing an attribute

Attributes are defined as described in chapter 5.3.2. Nevertheless, some methods implementing them have to be written. These methods names are fixed and depend on attribute name. They have to be called:

- `is_<Attr_name>_allowed(self, req_type)`
- `read_<Attr_name>(self, attr)`
- `write_<Attr_name>(self, attr)`

For instance, with an attribute called *MyAttr*, its is_allowed method has to be called *is_MyAttr_allowed*, its read method has to be called *read_MyAttr* and its write method has to be called *write_MyAttr*. The *attr* parameter is an instance of `Attr`. Unlike the commands, the is_allowed method for attributes receives a parameter of type `AttReqtype`.

Please check *Data types* chapter to understand the data types that can be used in attribute.

The following code is an example of how you write code executed when a client read an attribute which is called *Long_attr*:

```
1 def read_Long_attr(self, the_att):
2     self.info_stream("read attribute name Long_attr")
3     the_att.set_value(self.attr_long)
```

Line 1 Method declaration with "the_att" being an instance of the Attribute class representing the Long_attr attribute

Line 2 write a log message to the tango INFO stream (click *here* for more information about PyTango log system).

Line 3 Set the attribute value using the method set_value() with the attribute value as parameter.

The following code is an example of how you write code executed when a client write the Short_attr_rw attribute:

```
1  def write_Short_attr_rw(self,the_att):
2      self.info_stream("In write_Short_attr_rw for attribute ",the_att.get_name())
3      self.attr_short_rw = the_att.get_write_value(data)
```

Line 1 Method declaration with "the_att" being an instance of the Attribute class representing the Short_attr_rw attribute

Line 2 write a log message to the tango INFO stream (click *here* for more information about PyTango log system).

Line 3 Get the value sent by the client using the method get_write_value() and store the value written in the device object. Our attribute is a scalar short attribute so the return value is an int

CHAPTER

SEVEN

FAQ

Answers to general Tango questions can be found at http://www.tango-controls.org/tutorials

Please also check http://www.tango-controls.org/howtos for a list of Tango howtos

Where are the usual bjam files?

Starting from PyTango 7.0.0 the prefered way to build PyTango is using the standard python distutils package. This means that:

- you do NOT have to install the additional bjam package
- you do NOT have to change 3 configuration files
- you do NOT need to have 2Gb of RAM to compile PyTango.

Please check the compilation chapter for details on how to build PyTango.

I got a libbost_python error when I try to import PyTango module

doing:

```
>>> import PyTango
ImportError: libboost_python-gcc43-mt-1_38.so.1.38.0: cannot open shared object file: No suc
```

You must check that you have the correct boost python installed on your computer. To see which boost python file PyTango needs type:

```
$ ldd /usr/lib/python2.5/site-packages/PyTango/_PyTango.so
linux-vdso.so.1 =>  (0x00007fff48bfe000)
libtango.so.7 => /home/homer/local/lib/libtango.so.7 (0x00007f393fabb000)
liblog4tango.so.4 => /home/homer/local/lib/liblog4tango.so.4 (0x00007f393f8a0000)
**libboost_python-gcc43-mt-1_38.so.1.38.0 => not found**
libpthread.so.0 => /lib/libpthread.so.0 (0x00007f393f65e000)
librt.so.1 => /lib/librt.so.1 (0x00007f393f455000)
libdl.so.2 => /lib/libdl.so.2 (0x00007f393f251000)
libomniORB4.so.1 => /usr/local/lib/libomniORB4.so.1 (0x00007f393ee99000)
libomniDynamic4.so.1 => /usr/local/lib/libomniDynamic4.so.1 (0x00007f393e997000)
libomnithread.so.3 => /usr/local/lib/libomnithread.so.3 (0x00007f393e790000)
libCOS4.so.1 => /usr/local/lib/libCOS4.so.1 (0x00007f393e359000)
libgcc_s.so.1 => /lib/libgcc_s.so.1 (0x00007f393e140000)
libc.so.6 => /lib/libc.so.6 (0x00007f393ddce000)
libstdc++.so.6 => /usr/lib/libstdc++.so.6 (0x00007f393dac1000)
libm.so.6 => /lib/libm.so.6 (0x00007f393d83b000)
/lib64/ld-linux-x86-64.so.2 (0x00007f3940a4c000)
```

My python code uses PyTango 3.0.4 API. How do I change to 7.0.0 API?

To ease migration effort, PyTango 7 provides an alternative module called PyTango3.

Changing your python import from:

```
import PyTango
```

to:

```
import PyTango3 as PyTango
```

should allow you to execute your old PyTango code using the new PyTango 7 library.

Please note that you should as soon as possible migrate the code to Tango 7 since the PyTango team cannot assure the maintainability of the PyTango3 module.

Please find below a basic set of rules to migrate from PyTango 3.0.x to 7:

General rule of thumb for data types

The first important thing to be aware of when migrating from PyTango <= 3.0.4 to PyTango >= 7 is that the data type mapping from tango to python and vice versa is not always the same. The following table summarizes the differences:

Tango data type	PyTango 7 type	PyTango <= 3.0.4 type
DEV_VOID	No data	No data
DEV_BOOLEAN	bool	bool
DEV_SHORT	int	int
DEV_LONG	int	int
DEV_LONG64	long (on a 32 bits computer) or int (on a 64 bits computer)	long (on a 32 bits computer) or int (on a 64 bits computer)
DEV_FLOAT	float	float
DEV_DOUBLE	float	float
DEV_USHORT	int	int
DEV_ULONG	int	int
DEV_ULONG64	long (on a 32 bits computer) or int (on a 64 bits computer)	long (on a 32 bits computer) or int (on a 64 bits computer)
DEV_STRING	str	str
DEVVAR_CHARARRAY	sequence<int>	list<int>
DEVVAR_SHORTARRAY	sequence<int>	list<int>
DEVVAR_LONGARRAY	sequence<int>	list<int>
DEVVAR_LONG64ARRAY	sequence<long> (on a 32 bits computer) or sequence<int> (on a 64 bits computer)	list<long> (on a 32 bits computer) or list<int> (on a 64 bits computer)
DEVVAR_FLOATARRAY	sequence<float>	list<float>
DEVVAR_DOUBLEARRAY	sequence<float>	list<float>
DEVVAR_USHORTARRAY	sequence<int>	list<int>
DEVVAR_ULONGARRAY	sequence<int>	list<int>
DEVVAR_ULONG64ARRAY	sequence<long> (on a 32 bits computer) or sequence<int> (on a 64 bits computer)	list<long> (on a 32 bits computer) or list<int> (on a 64 bits computer)
DEVVAR_STRINGARRAY	sequence<str>	list<str>
DEVVAR_LONGSTRINGARRAY	A sequence with two elements: 1. sequence<int> 2. sequence<str>	**A list with two elements:** 1. list<int> 2. list<str>
DEVVAR_DOUBLESTRINGARRAY	A sequence with two elements: 1. sequence<float> 2. sequence<str>	**A list with two elements:** 1. list<float> 2. list<str>

Note that starting from PyTango 7 you **cannot assume anything** about the concrete sequence implementation for the tango array types in PyTango. This means that the following code (valid in PyTango <= 3.0.4):

```
import PyTango
dp = PyTango.DeviceProxy("my/device/experiment")
da = dp.read_attribute("array_attr")
if isinstance(da.value, list):
    print "array_attr is NOT a scalar attribute"
```

must be replaced with:

```
import operator, types
import PyTango
dp = PyTango.DeviceProxy("my/device/experiment")
da = dp.read_attribute("array_attr")
if operator.isSequence(da.value) and not type(da.value) in types.StringTypes:
    print "array_attr is NOT a scalar attribute"
```

Note that the above example is intended for demonstration purposes only. For reference, the proper code would be:

```
import PyTango
dp = PyTango.DeviceProxy("my/device/experiment")
da = dp.read_attribute("array_attr")
if not da.data_format is PyTango.AttrDataFormat.SCALAR:
    print "array_attr is NOT a scalar attribute"
```

Server

1. replace *PyTango.PyUtil* with `Util`
2. replace *PyTango.PyDeviceClass* with `DeviceClass`
3. **state and status overwrite** in PyTango <= 3.0.4, in order to overwrite the default state and status in a device server, you had to reimplement **State()** and **Status()** methods respectively.

   in PyTango 7 the methods have been renamed to **dev_state()** and **dev_status()** in order to match the C++ API.

General

1. **AttributeValue does NOT exist anymore.**
   - the result of a read_attribute call on a `DeviceProxy` / `Group` is now a `DeviceAttribute` object
   - write_attribute does not accept AttributeValue anymore

   (See `DeviceProxy` API documentation for more details)
2. **command_inout for commands with parameter type DevVar****StringArray don't accept items in second sequ**
   For example, a tango command 'DevVoid Go(DevVarDoubleArray)' in tango 3.0.4 could be executed by calling:

   ```
   dev_proxy.command_inout( 'Go', [[1.0, 2.0], [1, 2, 3]] )
   ```

   and the second list would internally be converted to ['1', '2', '3']. Starting from PyTango 7 this is not allowed anymore. So the above code must be changed to:

   ```
   dev_proxy.command_inout( 'Go', [[1.0, 2.0], ['1', '2', '3']] )
   ```

3. **`EventType` enumeration constants changed to match C++ enumeration**

    - CHANGE -> CHANGE_EVENT
    - QUALITY -> QUALITY_EVENT
    - PERIODIC -> PERIODIC_EVENT
    - ARCHIVE -> ARCHIVE_EVENT
    - USER -> USER_EVENT
    - ATTR_CONF_EVENT remains

4. **Exception handling** in 3.0.4 `DevFailed` was a tuple of dictionaries. Now `DevFailed` is a tuple of `DevError`. This means that code:

    ```
    try:
        tango_fail()
    except PyTango.DevFailed as e:
        print e.args[0]['reason']
    ```

    needs to be replaced with:

    ```
    try:
        tango_fail()
    except PyTango.DevFailed as e:
        print e.args[0].reason
    ```

Optional

The following is a list of API improvements. Some where added for performance reasons, others to allow for a more pythonic interface, others still to reflect more adequately the C++ interface. They are not mandatory since the original interface will still be available.

Why is there a "-Wstrict-prototypes" warning when I compile PyTango?

The PyTango prefered build system (distutils) uses the same flags used to compile Python to compile PyTango. It happens that Python is compiled as a pure C library while PyTango is a C++ library. Unfortunately one of the flags used by Python is the "-Wstrict-prototypes" which makes sence in a C compilation but not in a C++ compilation. For reference here is the complete error message you may have:

> *cc1plus: warning: command line option "-Wstrict-prototypes" is valid for Ada/C/ObjC but not for C++*

Do not worry about this warning since the compiler is ignoring the presence of this flag in the compilation.

Why are there so many warnings when generating the documentation?

PyTango uses boost python for the binding between C++ and Python and sphinx for document generation. When sphinx generates the PyTango API documentation it uses introspection to search for documentation in the python code. It happens that boost overrides some python introspection API for functions and methods which sphinx expects to have. Therefore you should see many warnings of type:

> *(WARNING/2) error while formatting signature for PyTango.Device_4Impl.always_executed_hook: **arg is not a Python function***

Do not worry since sphinx is able to generate the proper documentation.

CHAPTER

EIGHT

PYTANGO ENHANCEMENT PROPOSALS

8.1 TEP 1 - Device Server High Level API

TEP:	1
Title:	Device Server High Level API
Version:	2.2.0
Last-Modified:	10-Sep-2014
Author:	Tiago Coutinho <tcoutinho@cells.es>
Status:	Active
Type:	Standards Track
Content-Type:	text/x-rst
Created:	17-Oct-2012

8.1.1 Abstract

This TEP aims to define a new high level API for writting device servers.

8.1.2 Rationale

The code for Tango device servers written in Python often obey a pattern. It would be nice if non tango experts could create tango device servers without having to code some obscure tango related code. It would also be nice if the tango programming interface would be more pythonic. The final goal is to make writting tango device servers as easy as:

```
class Motor(Device):
    __metaclass__ = DeviceMeta

    position = attribute()

    def read_position(self):
        return 2.3

    @command()
    def move(self, position):
        pass

if __name__ == "__main__":
    server_run((Motor,))
```

8.1.3 Places to simplify

After looking at most python device servers one can see some patterns:

At *<Device>* class level:

1. <Device> always inherits from latest available DeviceImpl from pogo version
2. **constructor always does the same:**
    (a) calls super constructor
    (b) debug message
    (c) calls init_device
3. all methods have debug_stream as first instruction
4. init_device does additionaly get_device_properties()
5. *read attribute* methods follow the pattern:

```
def read_Attr(self, attr):
  self.debug_stream()
  value = get_value_from_hardware()
  attr.set_value(value)
```

6. *write attribute* methods follow the pattern:

```
def write_Attr(self, attr):
  self.debug_stream()
  w_value = attr.get_write_value()
  apply_value_to_hardware(w_value)
```

At *<Device>Class* class level:

1. A <Device>Class class exists for every <DeviceName> class
2. The <Device>Class class only contains attributes, commands and properties descriptions (no logic)
3. The attr_list description always follows the same (non explicit) pattern (and so does cmd_list, class_property_list, device_property_list)
4. the syntax for attr_list, cmd_list, etc is far from understandable

At *main()* level:

1. **The main() method always does the same:**
    (a) create *Util*
    (b) register tango class
    (c) when registering a python class to become a tango class, 99.9% of times the python class name is the same as the tango class name (example: Motor is registered as tango class "Motor")
    (d) call *server_init()*
    (e) call *server_run()*

8.1.4 High level API

The goals of the high level API are:

Maintain all features of low-level API available from high-level API

Everything that was done with the low-level API must also be possible to do with the new API.

All tango features should be available by direct usage of the new simplified, cleaner high-level API and through direct access to the low-level API.

Automatic inheritance from the latest** `DeviceImpl`

Currently Devices need to inherit from a direct Tango device implementation (`DeviceImpl`, or `Device_2Impl`, `Device_3Impl`, `Device_4Impl`, etc) according to the tango version being used during the development.

In order to keep the code up to date with tango, every time a new Tango IDL is released, the code of **every** device server needs to be manually updated to ihnerit from the newest tango version.

By inheriting from a new high-level `Device` (which itself automatically *decides* from which DeviceImpl version it should inherit), the device servers are always up to date with the latest tango release without need for manual intervention (see `PyTango.server`).

Low-level way:

```python
class Motor(PyTango.Device_4Impl):
    pass
```

High-level way:

```python
class Motor(PyTango.server.Device):
    pass
```

Default implementation of `Device` constructor

99% of the different device classes which inherit from low level `DeviceImpl` only implement *__init__* to call their *init_device* (see `PyTango.server`).

`Device` already calls init_device.

Low-level way:

```python
class Motor(PyTango.Device_4Impl):

    def __init__(self, dev_class, name):
        PyTango.Device_4Impl.__init__(self, dev_class, name)
        self.init_device()
```

High-level way:

```python
class Motor(PyTango.server.Device):

    # Nothing to be done!

    pass
```

Default implementation of `init_device()`

99% of different device classes which inherit from low level `DeviceImpl` have an implementation of *init_device* which *at least* calls `get_device_properties()` (see `PyTango.server`).

`init_device()` already calls `get_device_properties()`.

Low-level way:

```
class Motor(PyTango.Device_4Impl):

    def init_device(self):
        self.get_device_properties()
```

High-level way:

```
class Motor(PyTango.server.Device):
    # Nothing to be done!
    pass
```

Remove the need to code `DeviceClass`

99% of different device servers only need to implement their own subclass of `DeviceClass` to register the attribute, commands, device and class properties by using the corresponding `attr_list`, `cmd_list`, `device_property_list` and `class_property_list`.

With the high-level API we completely remove the need to code the `DeviceClass` by registering attribute, commands, device and class properties in the `Device` with a more pythonic API (see `PyTango.server`)

1. Hide <*Device*>*Class* class completely
2. simplify *main()*

Low-level way:

```
class Motor(PyTango.Device_4Impl):

    def read_Position(self, attr):
        pass

class MotorClass(PyTango.DeviceClass):

    class_property_list = { }
    device_property_list = { }
    cmd_list = { }

    attr_list = {
        'Position':
            [[PyTango.DevDouble,
            PyTango.SCALAR,
            PyTango.READ]],
        }

    def __init__(self, name):
        PyTango.DeviceClass.__init__(self, name)
        self.set_type(name)
```

High-level way:

```
class Motor(PyTango.server.Device):

    position = PyTango.server.attribute(dtype=float, )

    def read_position(self):
        pass
```

Pythonic read/write attribute

With the low level API, it feels strange for a non tango programmer to have to write:

```
def read_Position(self, attr):
    # ...
    attr.set_value(new_position)

def read_Position(self, attr):
    # ...
    attr.set_value_date_quality(new_position, time.time(), AttrQuality.CHANGING)
```

A more pythonic away would be:

```
def read_position(self):
    # ...
    self.position = new_position

def read_position(self):
    # ...
    self.position = new_position, time.time(), AttrQuality.CHANGING
```

Or even:

```
def read_position(self):
    # ...
    return new_position

def read_position(self):
    # ...
    return new_position, time.time(), AttrQuality.CHANGING
```

Simplify *main()*

the typical *main()* method could be greatly simplified. initializing tango, registering tango classes, initializing and running the server loop and managing errors could all be done with the single function call to `server_run()`

Low-level way:

```
def main():
    try:
        py = PyTango.Util(sys.argv)
        py.add_class(MotorClass,Motor,'Motor')

        U = PyTango.Util.instance()
        U.server_init()
        U.server_run()

    except PyTango.DevFailed,e:
        print '-------> Received a DevFailed exception:',e
    except Exception,e:
        print '-------> An unforeseen exception occured....',e
```

High-level way:

```
def main():
    classes = Motor,
    PyTango.server_run(classes)
```

8.1.5 In practice

Currently, a pogo generated device server code for a Motor having a double attribute *position* would look like this:

```
#!/usr/bin/env python
# -*- coding:utf-8 -*-


##############################################################################
## license :
##============================================================================
##
## File :        Motor.py
##
## Project :
##
## $Author :      t$
##
## $Revision :    $
##
## $Date :        $
##
## $HeadUrl :     $
##============================================================================
##            This file is generated by POGO
##    (Program Obviously used to Generate tango Object)
##
##        (c) - Software Engineering Group - ESRF
##############################################################################

""""""

__all__ = ["Motor", "MotorClass", "main"]

__docformat__ = 'restructuredtext'

import PyTango
import sys
# Add additional import
#----- PROTECTED REGION ID(Motor.additionnal_import) ENABLED START -----#

#----- PROTECTED REGION END -----#  //      Motor.additionnal_import

##############################################################################
```

```
## Device States Description
##
## No states for this device
#############################################################################

class Motor (PyTango.Device_4Impl):

#--------- Add you global variables here --------------------------
#----- PROTECTED REGION ID(Motor.global_variables) ENABLED START -----#

#----- PROTECTED REGION END -----#  //      Motor.global_variables
#------------------------------------------------------------------
#    Device constructor
#------------------------------------------------------------------
    def __init__(self,cl, name):
        PyTango.Device_4Impl.__init__(self,cl,name)
        self.debug_stream("In " + self.get_name() + ".__init__()")
        Motor.init_device(self)

#------------------------------------------------------------------
#    Device destructor
#------------------------------------------------------------------
    def delete_device(self):
        self.debug_stream("In " + self.get_name() + ".delete_device()")
        #----- PROTECTED REGION ID(Motor.delete_device) ENABLED START -----#

        #----- PROTECTED REGION END -----#  //      Motor.delete_device

#------------------------------------------------------------------
#    Device initialization
#------------------------------------------------------------------
    def init_device(self):
        self.debug_stream("In " + self.get_name() + ".init_device()")
        self.get_device_properties(self.get_device_class())
        self.attr_Position_read = 0.0
        #----- PROTECTED REGION ID(Motor.init_device) ENABLED START -----#

        #----- PROTECTED REGION END -----#  //      Motor.init_device

#------------------------------------------------------------------
#    Always excuted hook method
#------------------------------------------------------------------
    def always_executed_hook(self):
        self.debug_stream("In " + self.get_name() + ".always_excuted_hook()")
        #----- PROTECTED REGION ID(Motor.always_executed_hook) ENABLED START -----#

        #----- PROTECTED REGION END -----#  //      Motor.always_executed_hook

#==================================================================
#
#    Motor read/write attribute methods
#
#==================================================================

#------------------------------------------------------------------
#    Read Position attribute
#------------------------------------------------------------------
    def read_Position(self, attr):
        self.debug_stream("In " + self.get_name() + ".read_Position()")
        #----- PROTECTED REGION ID(Motor.Position_read) ENABLED START -----#
        self.attr_Position_read = 1.0
        #----- PROTECTED REGION END -----#  //      Motor.Position_read
        attr.set_value(self.attr_Position_read)
```

```
#------------------------------------------------------------------
#    Read Attribute Hardware
#------------------------------------------------------------------
    def read_attr_hardware(self, data):
        self.debug_stream("In " + self.get_name() + ".read_attr_hardware()")
        #----- PROTECTED REGION ID(Motor.read_attr_hardware) ENABLED START -----#

        #----- PROTECTED REGION END -----#  //      Motor.read_attr_hardware


#==================================================================
#
#    Motor command methods
#
#==================================================================


#==================================================================
#
#    MotorClass class definition
#
#==================================================================
class MotorClass(PyTango.DeviceClass):

    #    Class Properties
    class_property_list = {
        }


    #    Device Properties
    device_property_list = {
        }


    #    Command definitions
    cmd_list = {
        }


    #    Attribute definitions
    attr_list = {
        'Position':
            [[PyTango.DevDouble,
            PyTango.SCALAR,
            PyTango.READ]],
        }


#------------------------------------------------------------------
#    MotorClass Constructor
#------------------------------------------------------------------
    def __init__(self, name):
        PyTango.DeviceClass.__init__(self, name)
        self.set_type(name);
        print "In Motor Class  constructor"

#==================================================================
#
#    Motor class main method
#
#==================================================================
def main():
    try:
        py = PyTango.Util(sys.argv)
        py.add_class(MotorClass,Motor,'Motor')

        U = PyTango.Util.instance()
        U.server_init()
        U.server_run()

    except PyTango.DevFailed,e:
        print '-------> Received a DevFailed exception:',e
    except Exception,e:
        print '-------> An unforeseen exception occured....',e

if __name__ == '__main__':
    main()
```

To make things more fair, let's analyse the stripified version of the code instead:

```
import PyTango
import sys

class Motor (PyTango.Device_4Impl):

    def __init__(self,cl, name):
        PyTango.Device_4Impl.__init__(self,cl,name)
        self.debug_stream("In " + self.get_name() + ".__init__()")
        Motor.init_device(self)

    def delete_device(self):
        self.debug_stream("In " + self.get_name() + ".delete_device()")

    def init_device(self):
        self.debug_stream("In " + self.get_name() + ".init_device()")
        self.get_device_properties(self.get_device_class())
        self.attr_Position_read = 0.0

    def always_executed_hook(self):
        self.debug_stream("In " + self.get_name() + ".always_excuted_hook()")

    def read_Position(self, attr):
        self.debug_stream("In " + self.get_name() + ".read_Position()")
        self.attr_Position_read = 1.0
        attr.set_value(self.attr_Position_read)

    def read_attr_hardware(self, data):
        self.debug_stream("In " + self.get_name() + ".read_attr_hardware()")


class MotorClass(PyTango.DeviceClass):

    class_property_list = {
        }


    device_property_list = {
        }


    cmd_list = {
        }
    attr_list = {
        'Position':
            [[PyTango.DevDouble,
            PyTango.SCALAR,
            PyTango.READ]],
        }

    def __init__(self, name):
        PyTango.DeviceClass.__init__(self, name)
        self.set_type(name);
        print "In Motor Class  constructor"


def main():
    try:
        py = PyTango.Util(sys.argv)
        py.add_class(MotorClass,Motor,'Motor')

        U = PyTango.Util.instance()
        U.server_init()
        U.server_run()

    except PyTango.DevFailed,e:
        print '-------> Received a DevFailed exception:',e
    except Exception,e:
        print '-------> An unforeseen exception occured....',e

if __name__ == '__main__':
    main()
```

And the equivalent HLAPI version of the code would be:

```
#!/usr/bin/env python

from PyTango import DebugIt, server_run
from PyTango.server import Device, DeviceMeta, attribute


class Motor(Device):
    __metaclass__ = DeviceMeta

    position = attribute()

    @DebugIt()
    def read_position(self):
        return 1.0

def main():
    server_run((Motor,))

if __name__ == "__main__":
    main()
```

8.1.6 References

PyTango.server

8.1.7 Changes

from 2.1.0 to 2.2.0

Changed module name from *hlapi* to *server*

from 2.0.0 to 2.1.0

Changed module name from *api2* to *hlapi* (High Level API)

From 1.0.0 to 2.0.0

- **API Changes**
  - changed Attr to attribute
  - changed Cmd to command
  - changed Prop to device_property
  - changed ClassProp to class_property
- Included command and properties in the example
- Added references to API documentation

8.1.8 Copyright

This document has been placed in the public domain.

8.2 TEP 2 - Tango database serverless

TEP:	2
Title:	Tango database serverless
Version:	1.0.0
Last-Modified:	17-Oct-2012
Author:	Tiago Coutinho <tcoutinho@cells.es>
Status:	Active
Type:	Standards Track
Content-Type:	text/x-rst
Created:	17-Oct-2012
Post-History:	17-Oct-2012

8.2.1 Abstract

This TEP aims to define a python DataBaseds which doesn't need a database server behind. It would make tango easier to try out by anyone and it could greatly simplify tango installation on small environments (like small, independent laboratories).

8.2.2 Motivation

I was given a openSUSE laptop so that I could do the presentation for the tango meeting held in FRMII on October 2012. Since I planned to do a demonstration as part of the presentation I installed all mysql libraries, omniorb, tango and pytango on this laptop.

During the flight to Munich I realized tango was not working because of a strange mysql server configuration done by the openSUSE distribution. I am not a mysql expert and I couldn't google for a solution. Also it made me angry to have to install all the mysql crap (libmysqlclient, mysqld, mysql-administrator, bla, bla) just to have a demo running.

At the time of writting the first version of this TEP I still didn't solve the problem! Shame on me!

Also at the same tango meetting during the tango archiving discussions I heard fake whispers or changing the tango archiving from MySQL/Oracle to NoSQL.

I started thinking if it could be possible to have an alternative implementation of DataBaseds without the need for a mysql server.

8.2.3 Requisites

- no dependencies on external packages
- no need for a separate database server process (at least, by default)
- no need to execute post install scripts to fill database

8.2.4 Step 1 - Gather database information

It turns out that python has a Database API specification (**PEP 249**). Python distribution comes natively (>= 2.6) with not one but several persistency options (*Data Persistence*):

module	Native	Platforms	API	Database	Description
Native python 2.x					
`pickle`	Yes	all	dump/load	file	python serialization/marchalling module
`shelve`	Yes	all	dict	file	high level persistent, dictionary-like object
`marshal`	Yes	all	dump/load	file	Internal Python object serialization
`anydbm`	Yes	all	dict	file	Generic access to DBM-style databases. Wrapper for `dbhash`, `gdbm`, `dbm` or `dumbdbm`
`dbm`	Yes	all	dict	file	Simple "database" interface
`gdbm`	Yes	unix	dict	file	GNU's reinterpretation of dbm
`dbhash`	Yes	unix?	dict	file	DBM-style interface to the BSD database library (needs `bsddb`). **Removed in python 3**
`bsddb`	Yes	unix?	dict	file	Interface to Berkeley DB library. **Removed in python 3**
`dumbdbm`	Yes	all	dict	file	Portable DBM implementation
`sqlite3`	Yes	all	DBAPI2	file, memory	DB-API 2.0 interface for SQLite databases
Native Python 3.x					
`pickle`	Yes	all	dump/load	file	python serialization/marchalling module
`shelve`	Yes	all	dict	file	high level persistent, dictionary-like object
`marshal`	Yes	all	dump/load	file	Internal Python object serialization
`dbm`	Yes	all	dict	file	Interfaces to Unix "databases". Wrapper for `dbm.gnu`, `dbm.ndbm`, `dbm.dumb`
`dbm.gnu`	Yes	unix	dict	file	GNU's reinterpretation of dbm
`dbm.ndbm`	Yes	unix	dict	file	Interface based on ndbm
`dbm.dumb`	Yes	all	dict	file	Portable DBM implementation
`sqlite3`	Yes	all	DBAPI2	file, memory	DB-API 2.0 interface for SQLite databases

third-party DBAPI2

- pyodbc

- mxODBC
- kinterbasdb
- mxODBC Connect
- MySQLdb
- psycopg
- pyPgSQL
- PySQLite
- adodbapi
- pymssql
- sapdbapi
- ibm_db
- InformixDB

third-party NOSQL

(these may or not have python DBAPI2 interface)

- CouchDB - `couchdb.client`
- MongoDB - `pymongo` - NoSQL database
- Cassandra - `pycassa`

third-party database abstraction layer

- SQLAlchemy - `sqlalchemy` - Python SQL toolkit and Object Relational Mapper

8.2.5 Step 2 - Which module to use?

herrrr... wrong question!

The first decision I thought it should made is which python module better suites the needs of this TEP. Then I realized I would fall into the same trap as the C++ DataBaseds: hard link the server to a specific database implementation (in their case MySQL).

I took a closer look at the tables above and I noticed that python persistent modules come in two flavors: dict and DBAPI2. So naturally the decision I thought it had to be made was: *which flavor to use?*

But then I realized both flavors could be used if we properly design the python DataBaseds.

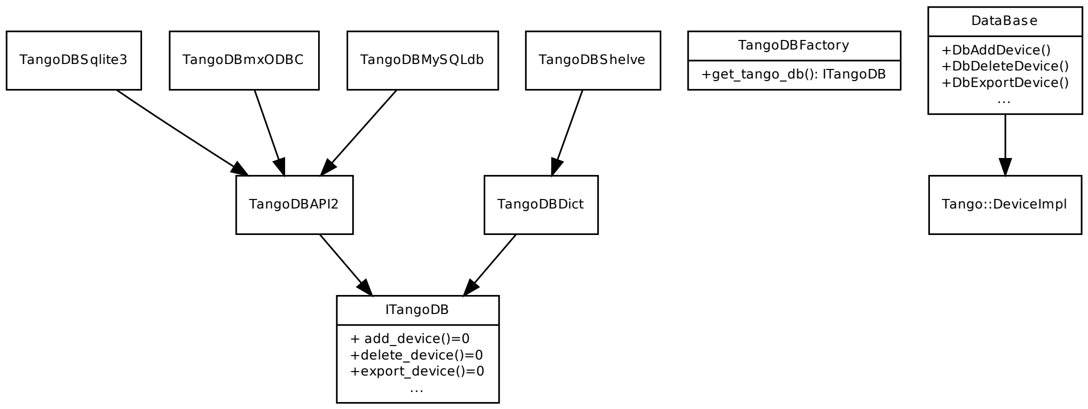
8.2.6 Step 3 - Architecture

If you step back for a moment and look at the big picture you will see that what we need is really just a mapping between the Tango DataBase set of attributes and commands (I will call this *Tango Device DataBase API*) and the python database API oriented to tango (I will call this TDB interface).

The TDB interface should be represented by the `ITangoDB`. Concrete databases should implement this interface (example, DBAPI2 interface should be represented by a class `TangoDBAPI2` implementing `ITangoDB`).

Connection to a concrete ITangoDB should be done through a factory: `TangoDBFactory`

The Tango DataBase device should have no logic. Through basic configuration it should be able to ask the `TangoDBFactory` for a concrete `ITangoDB`. The code of every command and attribute should be simple forward to the `ITangoDB` object (a part of some parameter translation and error handling).



8.2.7 Step 4 - The python DataBaseds

If we can make a python device server which has the same set of attributes and commands has the existing C++ DataBase (and of course the same semantic behavior), the tango DS and tango clients will never know the difference (BTW, that's one of the beauties of tango).

The C++ DataBase consists of around 80 commands and 1 mandatory attribute (the others are used for profiling) so making a python Tango DataBase device from scratch is out of the question.

Fortunately, C++ DataBase is one of the few device servers that were developed since the beginning with pogo and were successfully adapted to pogo 8. This means there is a precious `DataBase.xmi` available which can be loaded to pogo and saved as a python version. The result of doing this can be found here `here` (this file was generated with a beta version of the pogo 8.1 python code generator so it may contain errors).

8.2.8 Step 5 - Default database implementation

The decision to which database implementation should be used should obey the following rules:

1. should not require an extra database server process
2. should be a native python module
3. should implement python DBAPI2

It came to my attention the `sqlite3` module would be perfect as a default database implementation. This module comes with python since version 2.5 and is available in all platforms. It implements the DBAPI2 interface and can store persistently in a common OS file or even in memory.

There are many free scripts on the web to translate a mysql database to sqlite3 so one can use an existing mysql tango database and directly use it with the python DataBaseds with sqlite3 implementation.

8.2.9 Development

The development is being done in PyTango SVN trunk in the `PyTango.databaseds` module.

You can checkout with:

```
$ svn co https://tango-cs.svn.sourceforge.net/svnroot/tango-cs/bindings/PyTango/trunk PyTango-tru
```

8.2.10 Disadvantages

A serverless, file based, database has some disadvantages when compared to the mysql solution:

- Not possible to distribute load between Tango DataBase DS and database server (example: run the Tango DS in one machine and the database server in another)
- Not possible to have two Tango DataBase DS pointing to the same database
- Harder to upgrade to newer version of sql tables (specially if using dict based database)

Bare in mind the purpose of this TED is to simplify the process of trying tango and to ease installation and configuration on small environments (like small, independent laboratories).

8.2.11 References

- http://wiki.python.org/moin/DbApiCheatSheet
- http://wiki.python.org/moin/DbApiModuleComparison
- http://wiki.python.org/moin/DatabaseProgramming
- http://wiki.python.org/moin/DbApiFaq
- **PEP 249**
- http://wiki.python.org/moin/ExtendingTheDbApi
- http://wiki.python.org/moin/DbApi3

CHAPTER

NINE

HISTORY OF CHANGES

Contributers T. Coutinho

Last Update February 06, 2015

9.1 Document revisions

Date	Revision	Description	Author
18/07/03	1.0	Initial Version	M. Ounsy
06/10/03	2.0	Extension of the "Getting Started" paragraph	A. Buteau/M. Ou
14/10/03	3.0	Added Exception Handling paragraph	M. Ounsy
13/06/05	4.0	Ported to Latex, added events, AttributeProxy and ApiUtil	V. Forchì
13/06/05	4.1	fixed bug with python 2.5 and and state events new Database constructor	V. Forchì
15/01/06	5.0	Added Device Server classes	E.Taurel
15/03/07	6.0	Added AttrInfoEx, AttributeConfig events, 64bits, write_attribute	T. Coutinho
21/03/07	6.1	Added groups	T. Coutinho
15/06/07	6.2	Added dynamic attributes doc	E. Taurel
06/05/08	7.0	Update to Tango 6.1. Added DB methods, version info	T. Coutinho
10/07/09	8.0	Update to Tango 7. Major refactoring. Migrated doc	T. Coutinho/R. S
24/07/09	8.1	Added migration info, added missing API doc	T. Coutinho/R. S
21/09/09	8.2	Added migration info, release of 7.0.0beta2	T. Coutinho/R. S
12/11/09	8.3	Update to Tango 7.1.	T. Coutinho/R. S
??/12/09	8.4	Update to PyTango 7.1.0 rc1	T. Coutinho/R. S
19/02/10	8.5	Update to PyTango 7.1.1	T. Coutinho/R. S
06/08/10	8.6	Update to PyTango 7.1.2	T. Coutinho
05/11/10	8.7	Update to PyTango 7.1.3	T. Coutinho
08/04/11	8.8	Update to PyTango 7.1.4	T. Coutinho
13/04/11	8.9	Update to PyTango 7.1.5	T. Coutinho
14/04/11	8.10	Update to PyTango 7.1.6	T. Coutinho
15/04/11	8.11	Update to PyTango 7.2.0	T. Coutinho
12/12/11	8.12	Update to PyTango 7.2.2	T. Coutinho
24/04/12	8.13	Update to PyTango 7.2.3	T. Coutinho
21/09/12	8.14	Update to PyTango 8.0.0	T. Coutinho
10/10/12	8.15	Update to PyTango 8.0.2	T. Coutinho
20/05/13	8.16	Update to PyTango 8.0.3	T. Coutinho
28/08/13	8.13	Update to PyTango 7.2.4	T. Coutinho
27/11/13	8.18	Update to PyTango 8.1.1	T. Coutinho
16/05/14	8.19	Update to PyTango 8.1.2	T. Coutinho
30/09/14	8.20	Update to PyTango 8.1.4	T. Coutinho
01/10/14	8.21	Update to PyTango 8.1.5	T. Coutinho
05/02/15	8.22	Update to PyTango 8.1.6	T. Coutinho

9.2 Version history

version	Changes
8.1.6	Bug fixes: • 698: PyTango.Util discrepancy • 697: PyTango.server.run does not accept old Device style classes
8.1.5	Bug fixes: • 687: [pytango] 8.1.4 unexpected files in the source package • 688: PyTango 8.1.4 new style server commands don't work
8.1.4	Features: • 107: Nice to check Tango/PyTango version at runtime Bug fixes: • 659: segmentation fault when unsubscribing from events • 664: problem while installing PyTango 8.1.1 with pip (using pip 1.4.1) • 678: [pytango] 8.1.2 unexpected files in the source package • 679: PyTango.server tries to import missing __builtin__ module on Python 3 • 680: Cannot import PyTango.server.run • 686: Device property substitution for a multi-device server
8.1.3	*SKIPPED*
8.1.2	Features: • 98: PyTango.server.server_run needs additional post_init_callback parameter • 102: DevEncoded attribute should support a python buffer object • 103: Make creation of *EventData objects possible in PyTango Bug fixes: • 641: python3 error handling issue • 648: PyTango unicode method parameters fail • 649: write_attribute of spectrum/image fails in PyTango without numpy • 650: [pytango] 8.1.1 not compatible with ipyton 1.2.0-rc1 • 651: PyTango segmentation fault when run a DS that use attr_data.py • 660: command_inout_asynch (polling mode) fails • 666: PyTango shutdown sometimes blocks.
8.1.1	Features: • Implemented tango C++ 8.1 API Bug fixes: • 527: set_value() for ULong64

Last update: February 06, 2015

PYTHON MODULE INDEX