Taurus Tutorial

by Zbigniew Reszela

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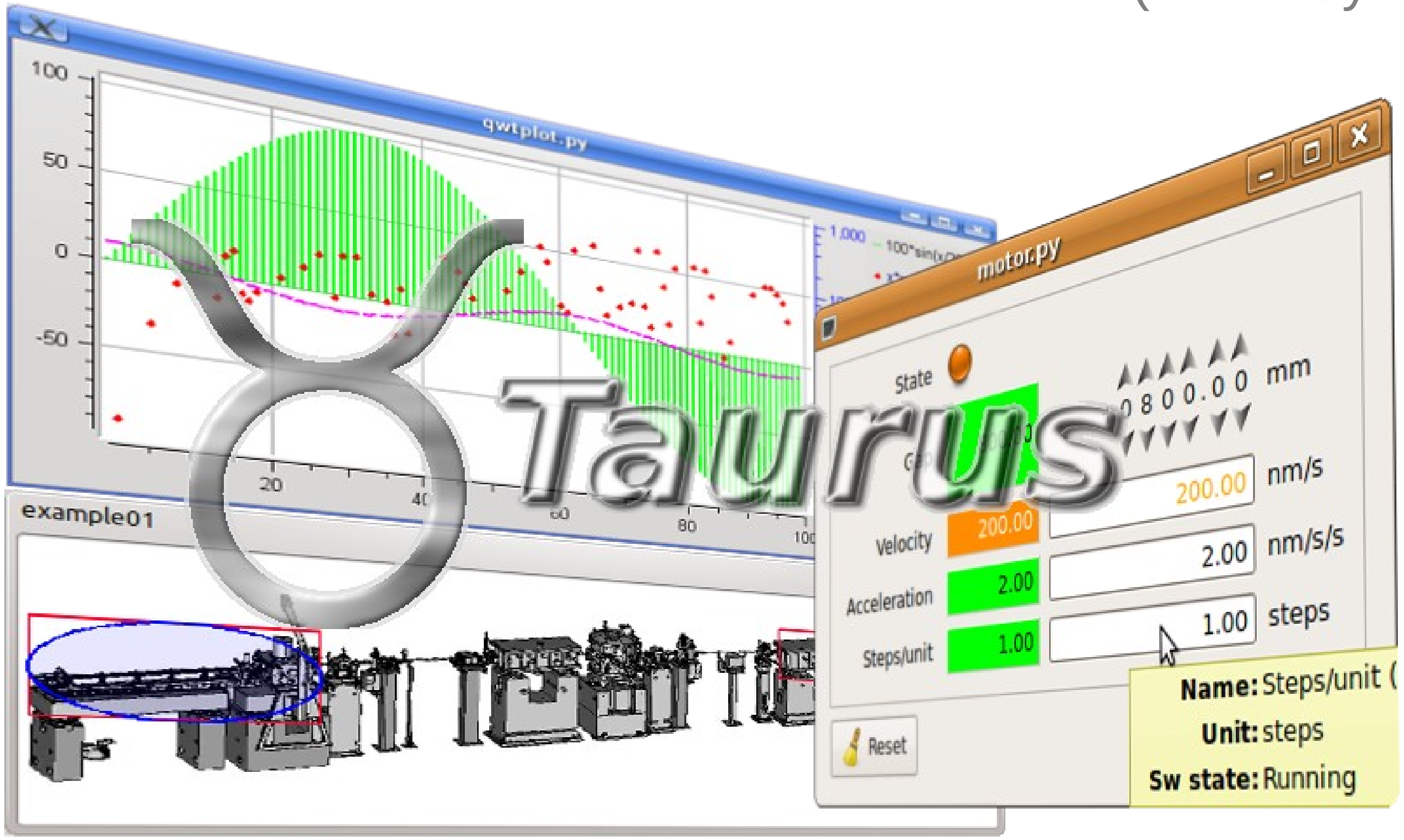
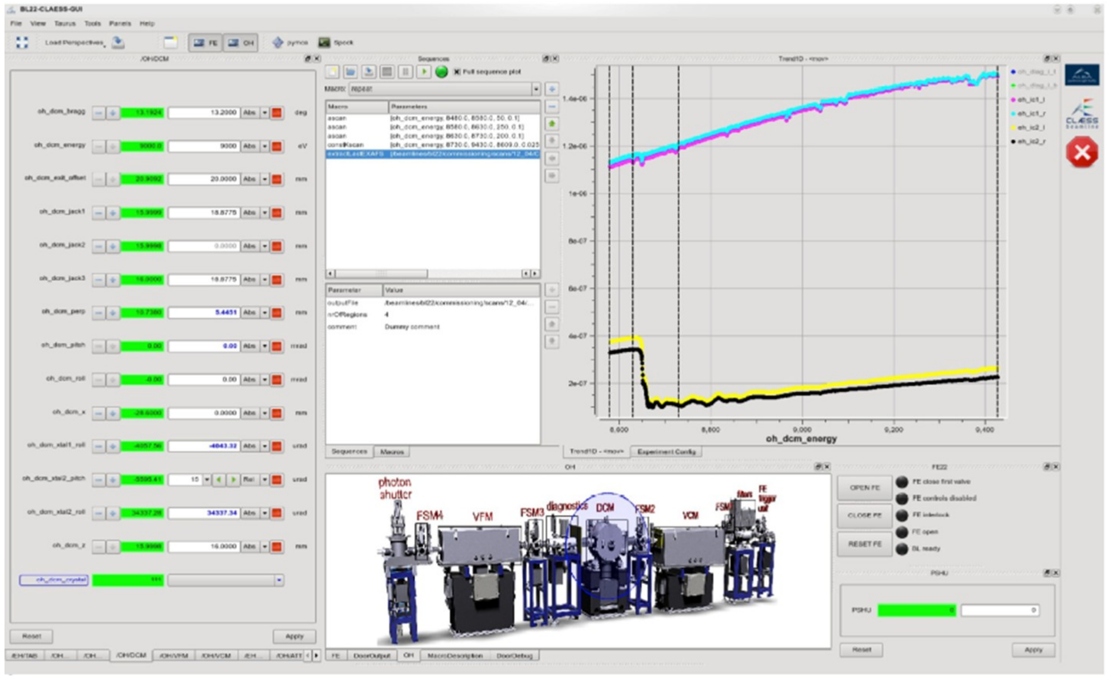


Also by:

- Martí Caixal
- Guifré Cuní
- Emilio Morales
- Miquel Navarro
- Jose Ramos
- Sergi Rubio

Contents

Taurus is...



*“**Taurus** is a **python** framework for control and data acquisition **CLIs** and **GUIs** in scientific/industrial environments. It supports multiple control systems or data sources: **Tango**, **EPICS**, ... New control system libraries can be integrated through plugins.”*

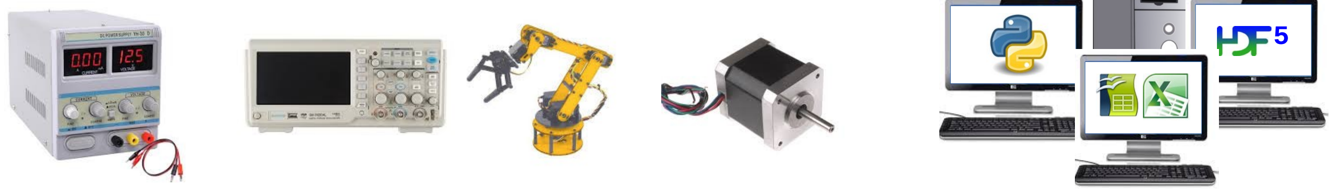
- Widely used
- Production-ready
- Well supported
- Actively developed
- Free/Open Source
- Community-driven
- Modular
- Multi-platform
- Based on Python and Qt
- Easy to install

Structure of Taurus

TaurusGUIs

TaurusGUIs

External Hardware and data sources

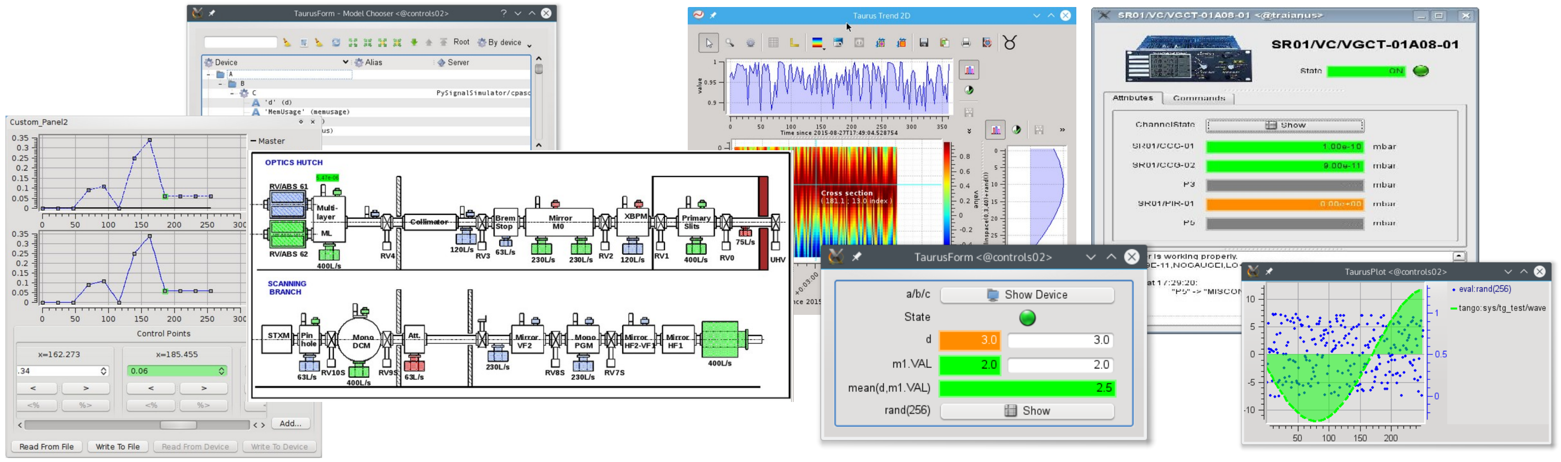


Structure of Taurus

TaurusGUIs

TaurusGUIs

Taurus Qt Widgets



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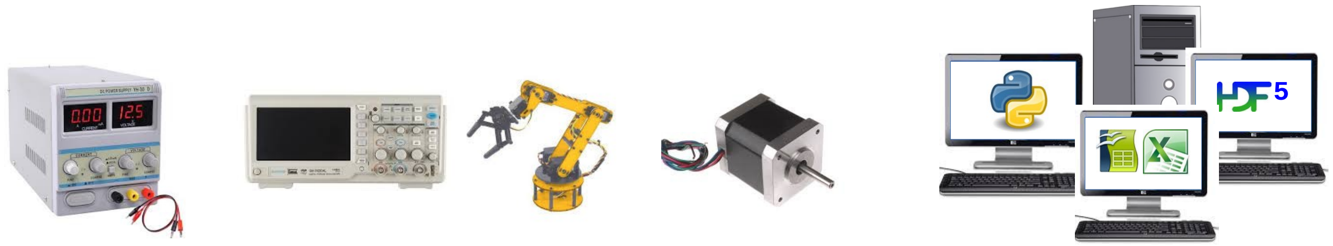


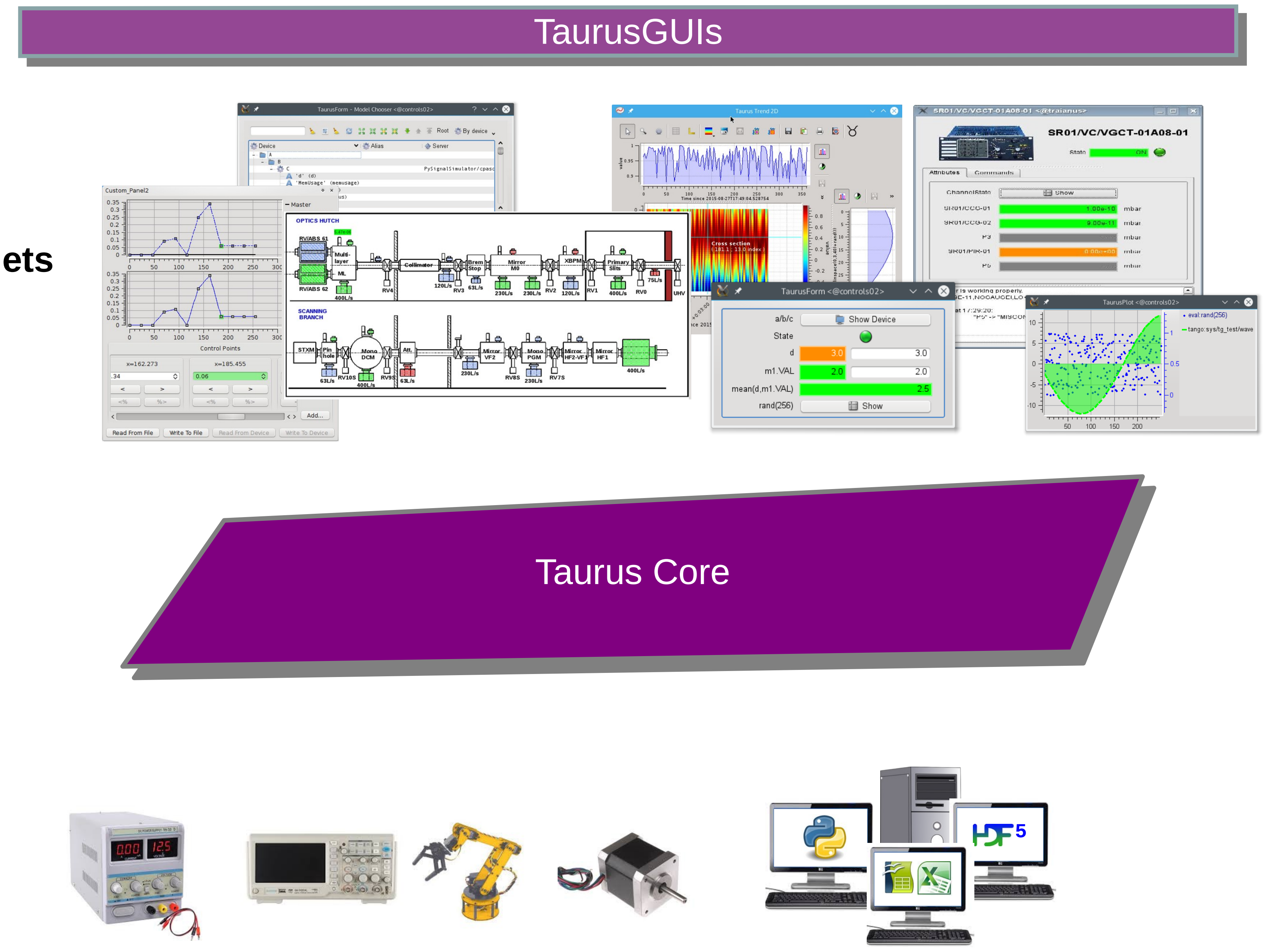
Structure of Taurus

TaurusGUIs

Taurus Qt Widgets

Taurus Core

External Hardware and data sources



Structure of Taurus

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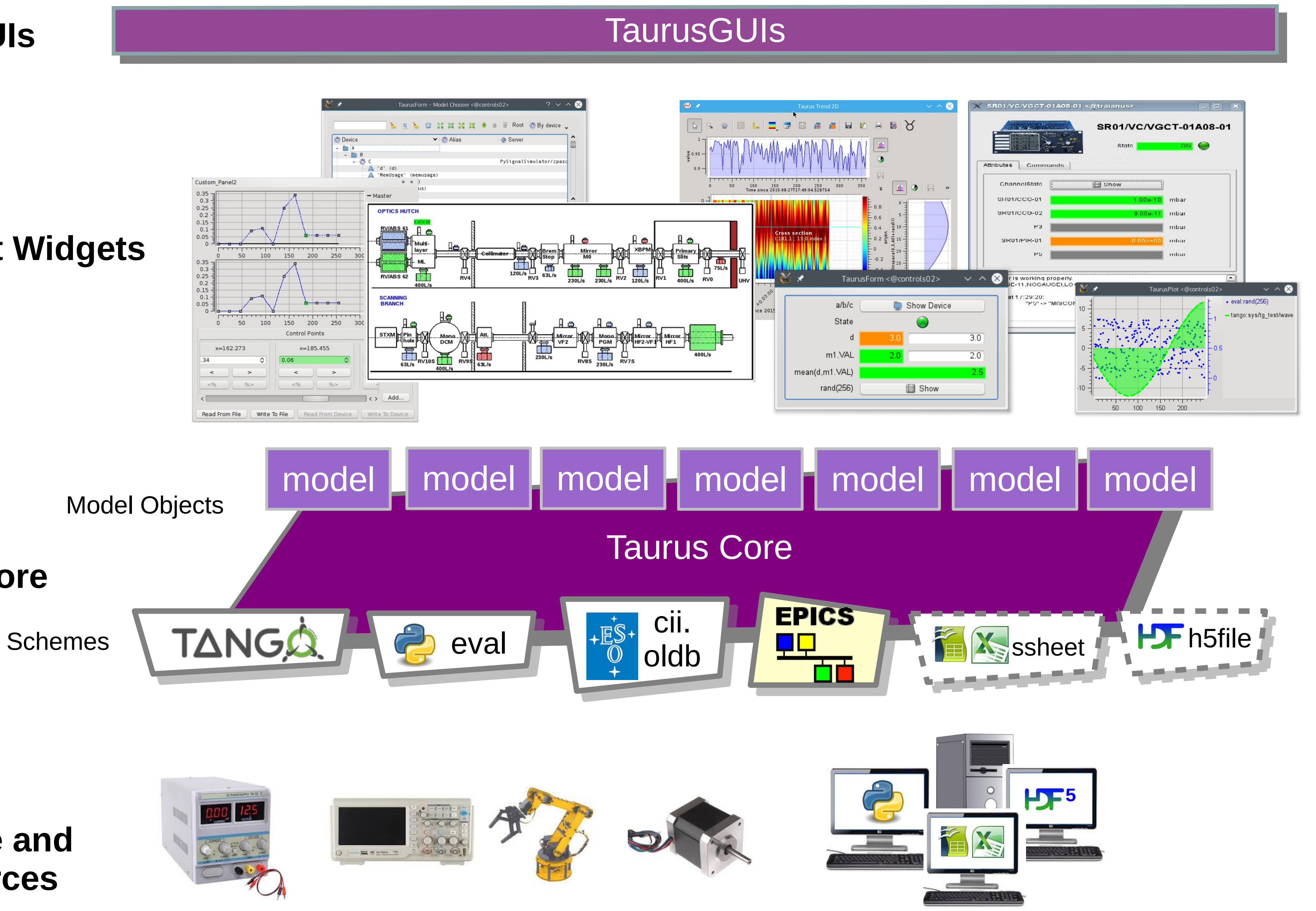
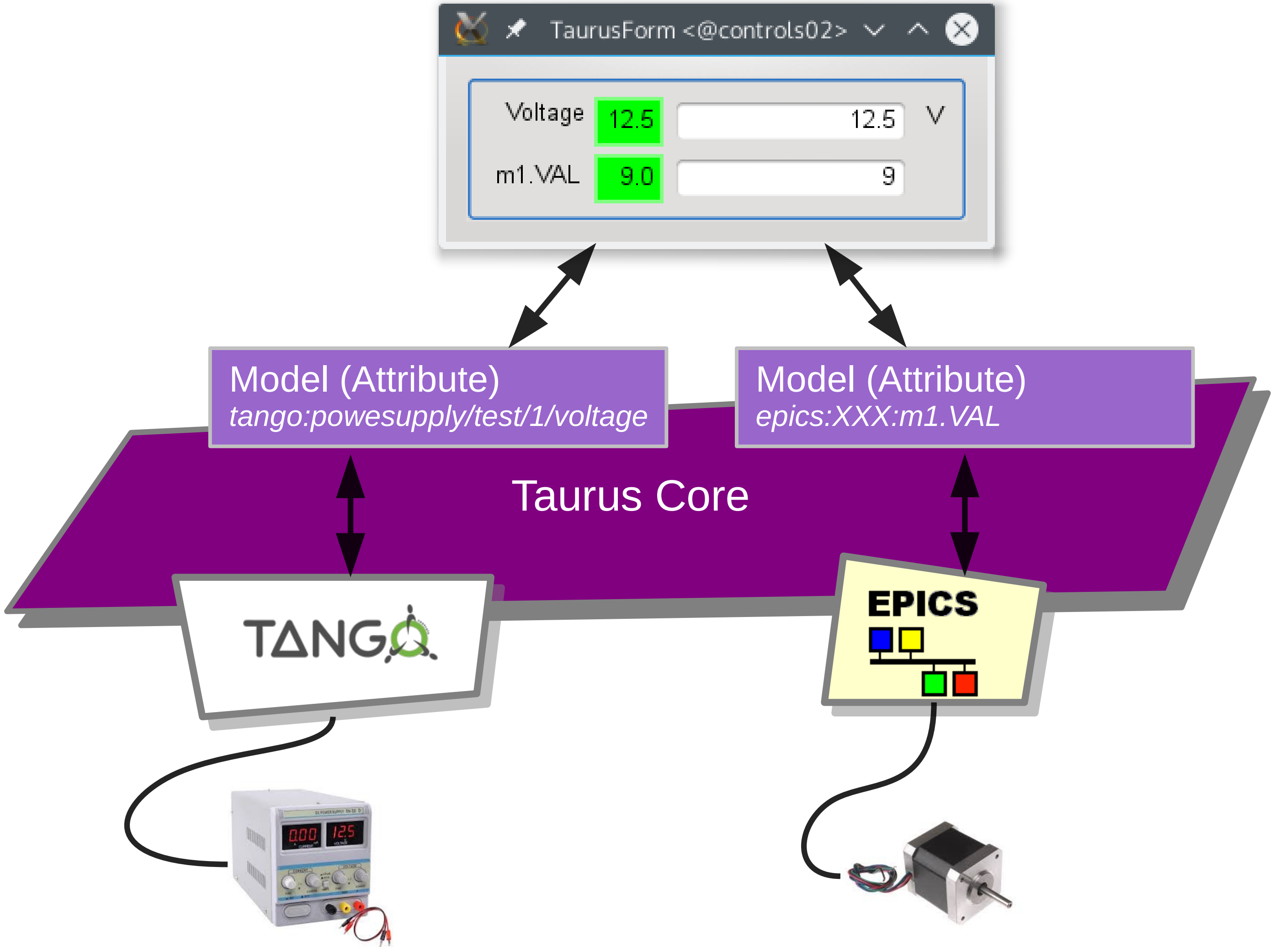


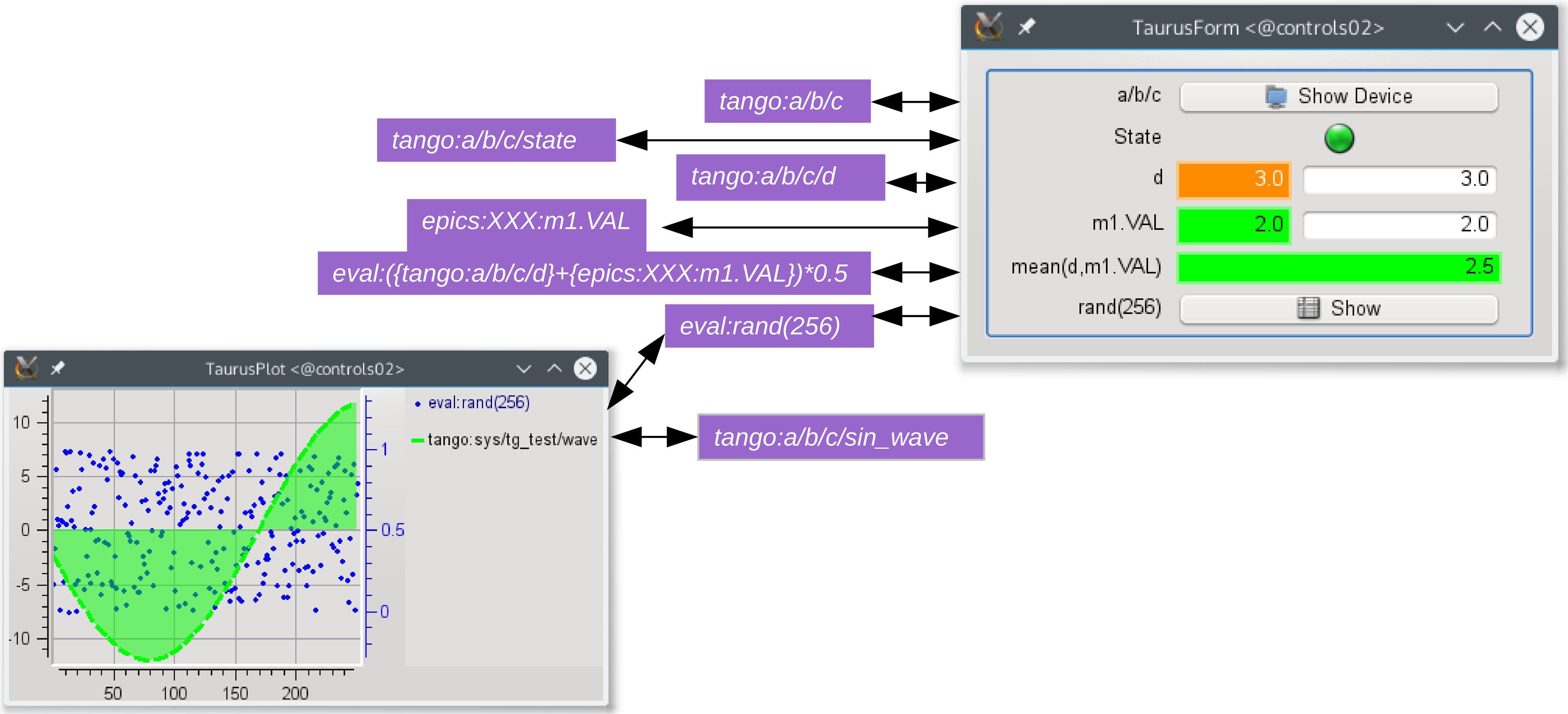
Model-View-controller

Taurus Qt Widgets (View & Controller)

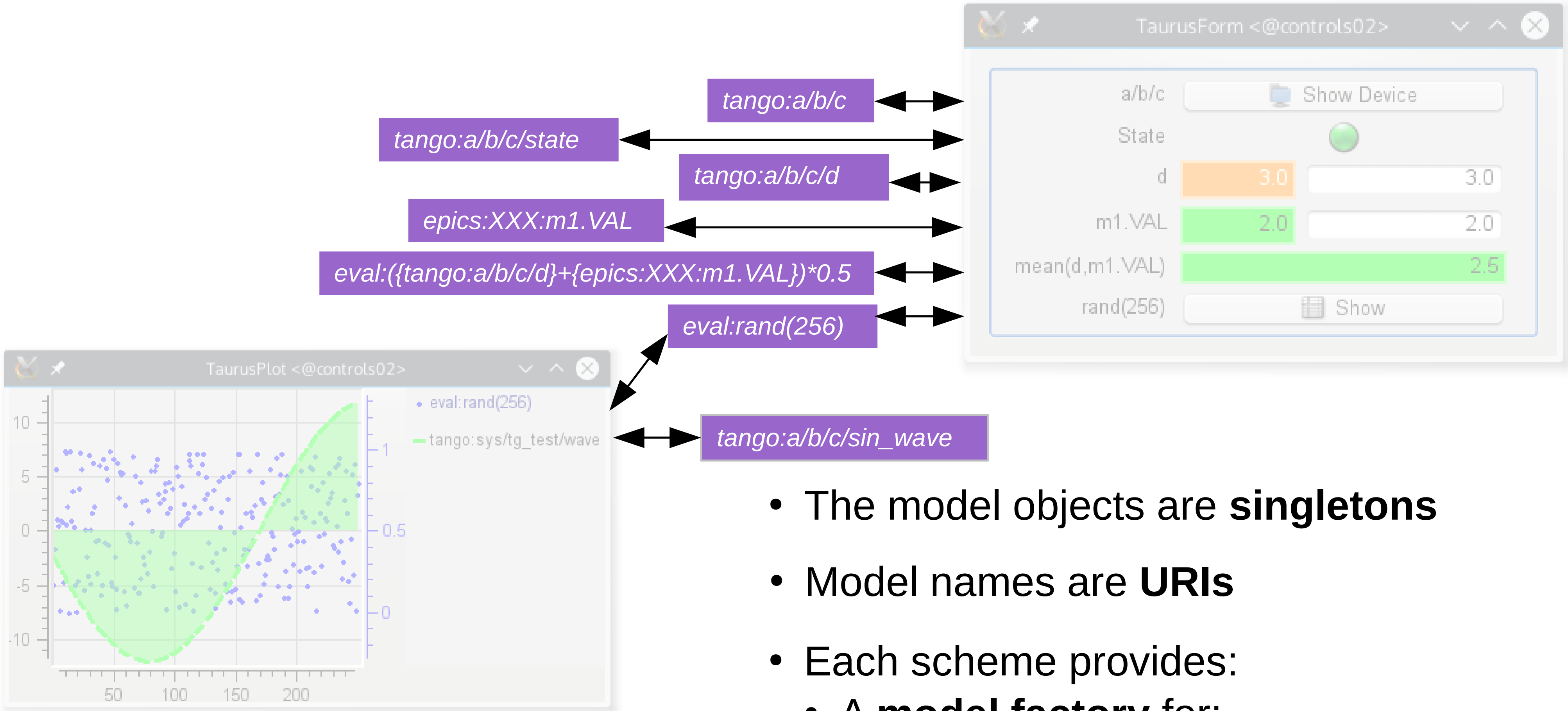
Taurus Core (Model)



Model-View-controller

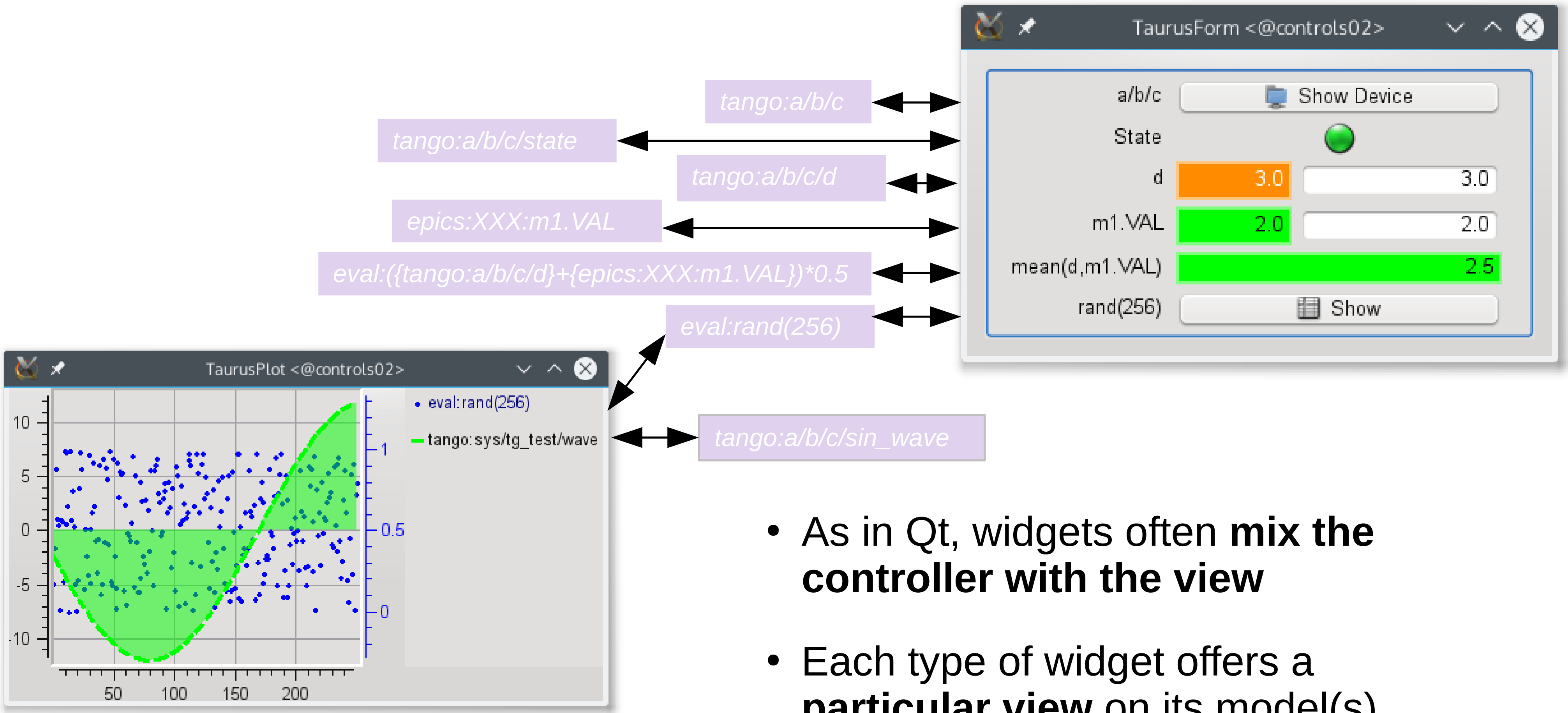


Model-View-controller



- The model objects are **singletons**
- Model names are **URIs**
- Each scheme provides:
  - A **model factory** for:
    - Authority
    - Device
    - Attribute
  - **Model name validators**

Model-View-controller



- As in Qt, widgets often **mix the controller with the view**
- Each type of widget offers a **particular view** on its model(s)
- All functionality is enabled by just **attaching** the widget to a model (i.e. providing its URI)

Examples of model names

scheme:authority/path?query#fragment

#	Model name (URI)	Scheme	Model type	Represented source of data/control object
1	*tango://foo:1234*	TANGO	Authority	**Tango** database listening to port *1234* of host *foo*
2	*tango://foo:1234/a/b/c*	TANGO	Device	**Tango** Device *a/b/c* registered in database *foo*
3	*tango:a/b/c/state*	TANGO	Attribute	**Tango** attribute *state* of device #2
4	*tango:a/b/c/d#units*	TANGO	Attribute	**Tango** attribute *d* of device #2 (*units* fragment)
5	*ca:XXX:m1.VAL*	EPICS	Attribute	**EPICS** process variable *XXX:m1.VAL*
6	*eval:({tango:a/b/c/d}+{epics:XXX:m1.VAL})*0.5*	eval	Attribute	**Calculated** average of the values of #4 and #5
7	*eval:rand(256)*	eval	Attribute	Random **generated** array of 256 values
8	*msenv://foo:1234/macroserver/bar/1/ScanDir*	[MSenv]	Attribute	*ScanDir* variable from **Sardana's environment**
9	*h5file:/mydir/myfile.hdf5*	HDF5	Device	File in **HDF5** format saved at */mydir/myfile*
10	*h5file:/mydir/myfile.hdf5:data/energy*	HDF5	Attribute	**HDF5** dataset *energy* of group *data* from file #9
11	*ssheet:myfile.ods:Sheet1.A1*		Attribute	Contents of cell A1 of Sheet1 of *myfile.ods* **spreadsheet**

Other suggested schemes:

Archiving, SQL, Icat, ASCII tables, ...

Installation

- PyPI
- Debian Linux
- **conda**

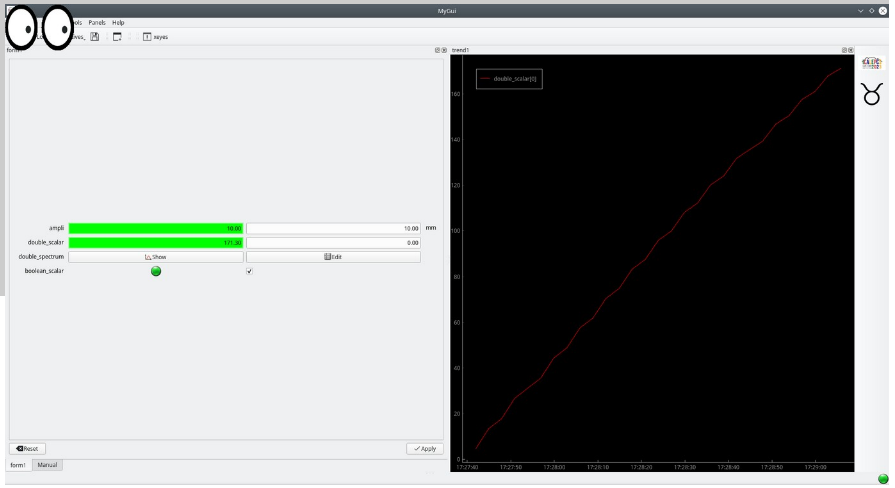
```
conda create -y -c conda-forge -n taurus_tutorial \
    taurus \
    taurus_pyqtgraph \
    qt=5.12 pytango=9.3 \   # see taurus#1233
    guidata=2.3.1 \         # guidata and guiqwt incompatibilities
    tango-test              # DS for demo purposes
conda activate taurus_tutorial
pip install pyhdbpp
```

More on: https://taurus-scada.org/users/getting_started.html

Contents

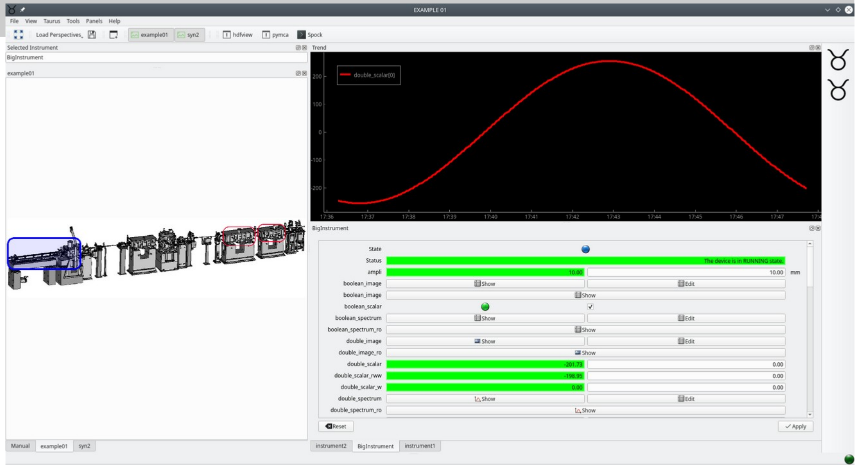
TaurusGUI – New GUI

```
# Start the TaurusGUI wizard
taurus newgui
 # next
 # select directory e.g. mygui → next
 # select GUI name: MyGui → next
 # select logo → next
 # skip: select synoptic → next
 # create panels editor e.g.
 #   create a form and a trend and connect to sys/tg_test/1 attrs
 # create external applications launcher e.g. xeyes
 # skip: configure monitor
 # install the project
# Start the application
mygui
# Dock the panels in the main window
# Launch the external application
```



TaurusGUI – example01

```
taurus gui example01
 # ignore errors, some extra dependencies are missing
 # unlock the view (Menu → View → Lock View)
 # dock panels in the main window
 # navigate over the lab with active synoptic and panels
 # save current view as a perspective
 # add panels: form and trend/plot and drag and drop models:
 # - from the same application
 # - from mygui (see previous slide) application
 # save current view as another perspective (save temp. panels)
 # switch between perspectives
 # restart application (save temp. panels on exit, save settings)
 # access perspectives
```



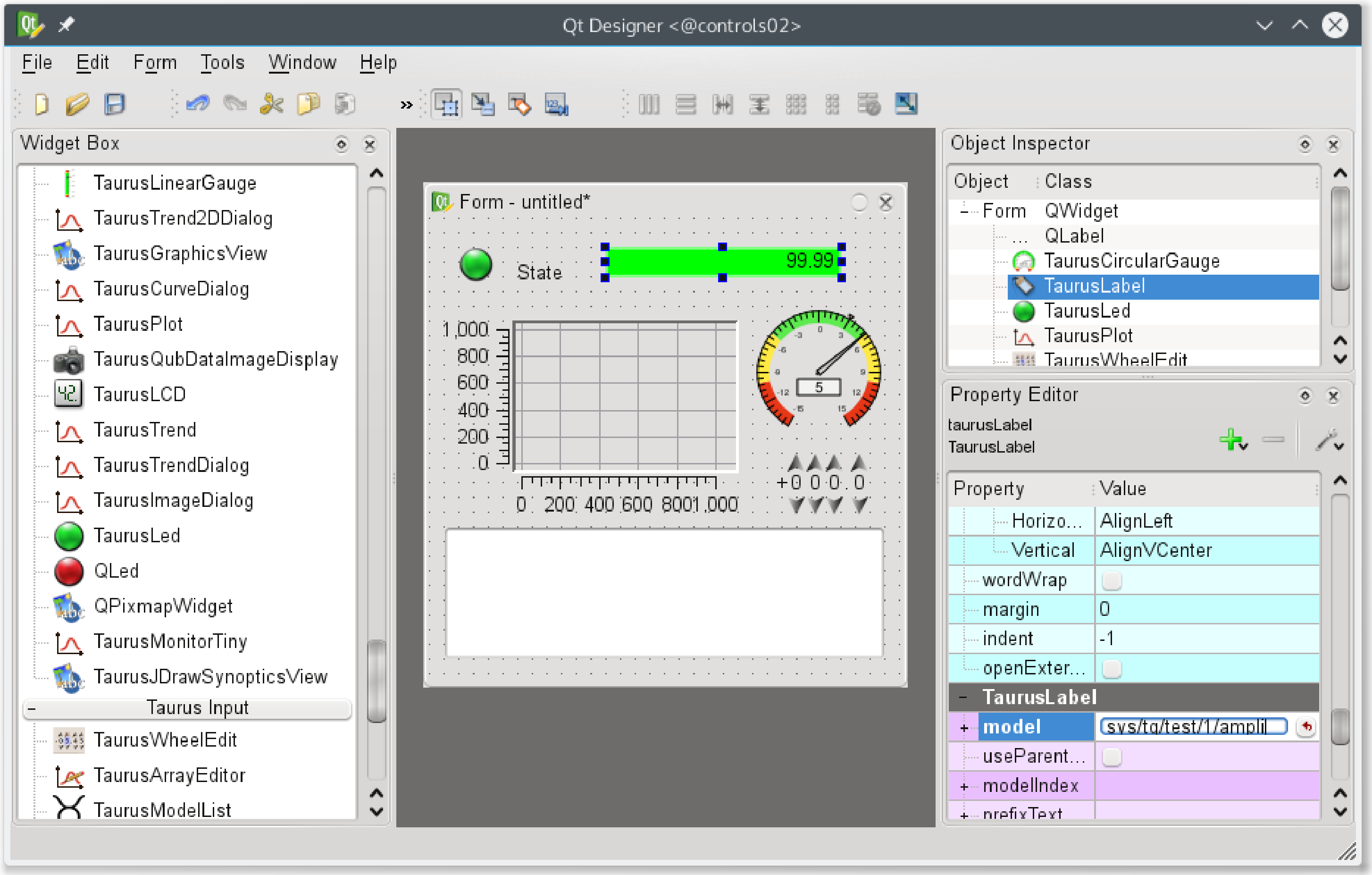
Contents

TaurusDesigner (Qt Designer)

GUIs can be created using the Qt Designer (*)

The Taurus widgets are available in the catalogue

The model name can be set as a Qt property



Object	Class
Form	QWidget
...	QLabel
	TaurusCircularGauge
	TaurusLabel
	TaurusLed
	TaurusPlot
	TaurusWheelEdit

tauruslabel
TaurusLabel

Property	Value
Horizo...	AlignLeft
Vertical	AlignVCenter
wordWrap	☐
margin	0
indent	-1
openExter...	☐
TaurusLabel	
model	sys/tg/test/1/ampli
useParent...	☐
modelIndex	
prefixText	

TaurusDesigner (Qt Designer)

```
taurus designer
 # Create a Widget with:
 # - Vertical Layout
 #   - TaurusTrend2DDialog connected to sys/tg_test/1/wave
 #   - Horizontal Layout
 #     - QLabel
 #     - TaurusValueLineEdit connected to sys/tg_test/1/ampli
 #   - Horizontal Layout
 #     - TaurusLed – State
 #     - TaurusCommandButton - connected to sys/tg_test/1
 #                           - configured with SwitchState()
 #
 # Store the widget as MyWidget.ui in the following place:
 #   MyWidget
 #    └── ui
 #        └── MyWidget.ui
```

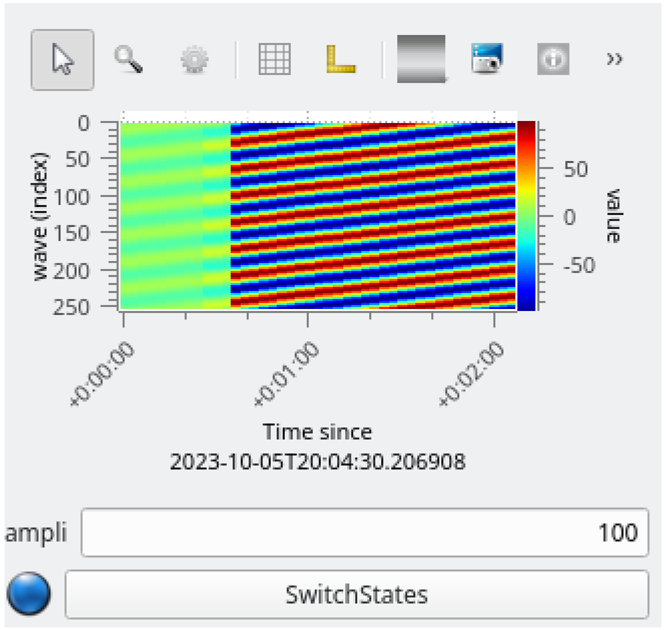
TaurusDesigner (Qt Designer)

https://taurus-scada.org/devel/api/taurus.qt.qtgui.util.html#taurus.qt.qtgui.util.UILoadable

```
# Create the following Python module:
from taurus.qt.qtgui.application import TaurusApplication
from taurus.external.qt import Qt
from taurus.qt.qtgui.util.ui import UILoadable

@UILoadable
class MyWidget(Qt.QWidget):

    def __init__(self, parent=None):
        Qt.QWidget.__init__(self, parent)
        self.loadUi()
        self.label.setText("ampli")

if __name__ == "__main__":
    import sys

    app = TaurusApplication()
    w = MyWidget()
    w.show()
    sys.exit(app.exec_())
```

TaurusDesigner (Qt Designer)

```
# Store the Python module in:
# MyWidget
#    ├── MyWidget.py
#    └── ui
#        └── MyWidget.ui
#
# Launch the application:
python MyWidget.py
```



Contents

How to “Taurus-ify” a Qt widget

- Create a widget that inherits both from a **`QWidget`** (or a QWidget-derived class) and from the `taurus.qt.qtgui.base.`**`TaurusBaseComponent`** *mixin* class.

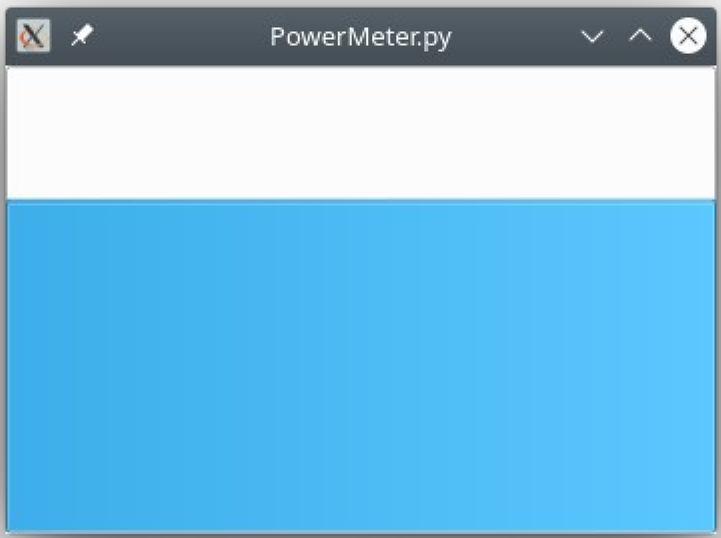
- These Taurus *mixin* class provide several APIs that are expected from Taurus widgets, such as:
  - model support API
  - configuration API
  - logger API
  - formatter API

- All you needs to do is to implement the **`handleEvent()`** method that will be called whenever the attached taurus model is updated.

How to “Taurus-ify” a Qt widget

- Store in `PowerMeter.py` and run it: **`python PowerMeter.py`**

```
from taurus.external.qt import Qt
from taurus.qt.qtgui.base import TaurusBaseComponent
from taurus.qt.qtgui.application import TaurusApplication


class PowerMeter(Qt.QProgressBar, TaurusBaseComponent):
    """A Taurus-ified QProgressBar"""


    # setFormat() defined by both TaurusBaseComponent and QProgressBar. Rename.
    setFormat = TaurusBaseComponent.setFormat
    setBarFormat = Qt.QProgressBar.setFormat


    def __init__(self, parent=None, value_range=(0, 100)):
        super(PowerMeter, self).__init__(parent=parent)
        self.setOrientation(Qt.Qt.Vertical)
        self.setRange(*value_range)
        self.setTextVisible(False)


    def handleEvent(self, evt_src, evt_type, evt_value):
        """reimplemented from TaurusBaseComponent"""
        try:
            self.setValue(int(evt_value.rvalue.m))
        except Exception as e:
            self.info("Skipping event. Reason: %s", e)


if __name__ == "__main__":
    import sys


    app = TaurusApplication()
    w = PowerMeter()
    w.setModel("eval:Q(60+20*rand())")
    w.show()
    sys.exit(app.exec_())
```

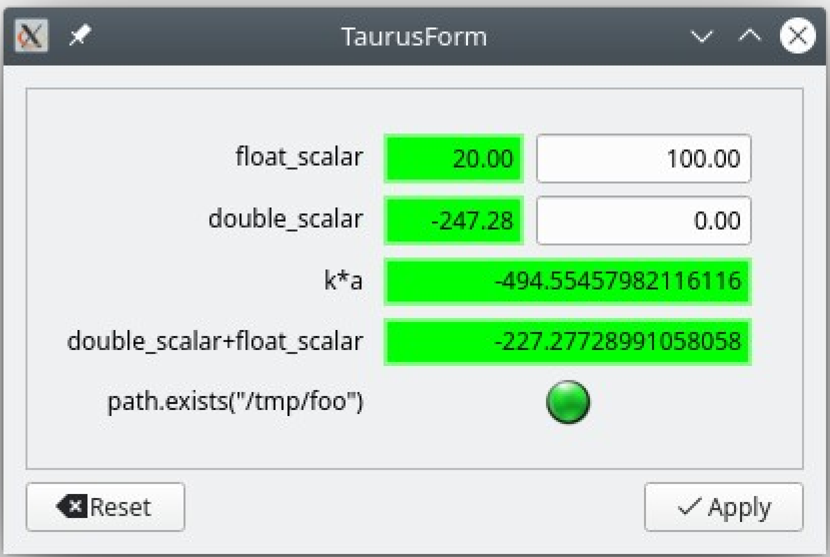


See more on: https://taurus-scada.org/devel/custom_widgets.html

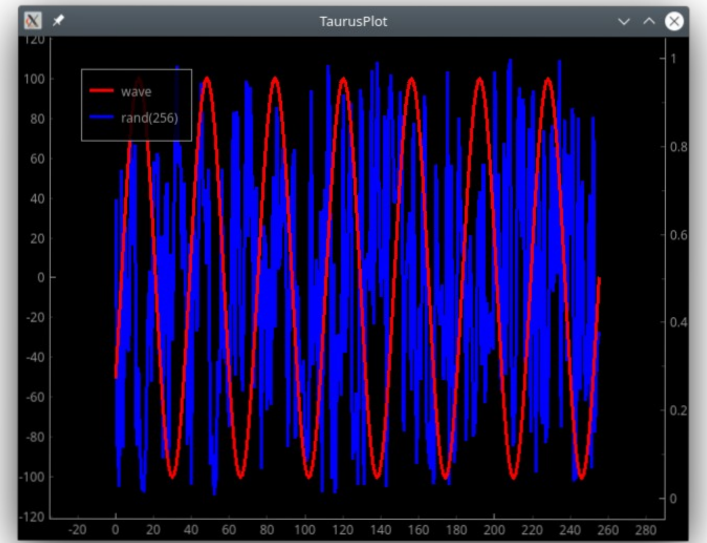
Bonus: Taurus Evaluation Scheme

https://taurus-scada.org/devel/api/taurus.core.evaluation.html#module-taurus.core.evaluation

```
# model name: eval:[//<authority>][@<evaluator>/][<subst>;]<expr>

taurus form \
sys/tg_test/1/float_scalar sys/tg_test/1/double_scalar \
'eval:{sys/tg_test/1/double_scalar}*2' \
'eval:k=2;a={sys/tg_test/1/double_scalar};k*a' \
'eval:{sys/tg_test/1/double_scalar}+{sys/tg_test/1/float_scalar}' \
'eval:@os.*/path.exists("/tmp/foo")'

taurus plot sys/tg_test/1/wave 'eval:rand(256)'
```


TaurusForm

float_scalar	20.00	100.00
double_scalar	-247.28	0.00
k*a	-494.55457982116116	
double_scalar+float_scalar	-227.27728991058058	
path.exists("/tmp/foo")	●	

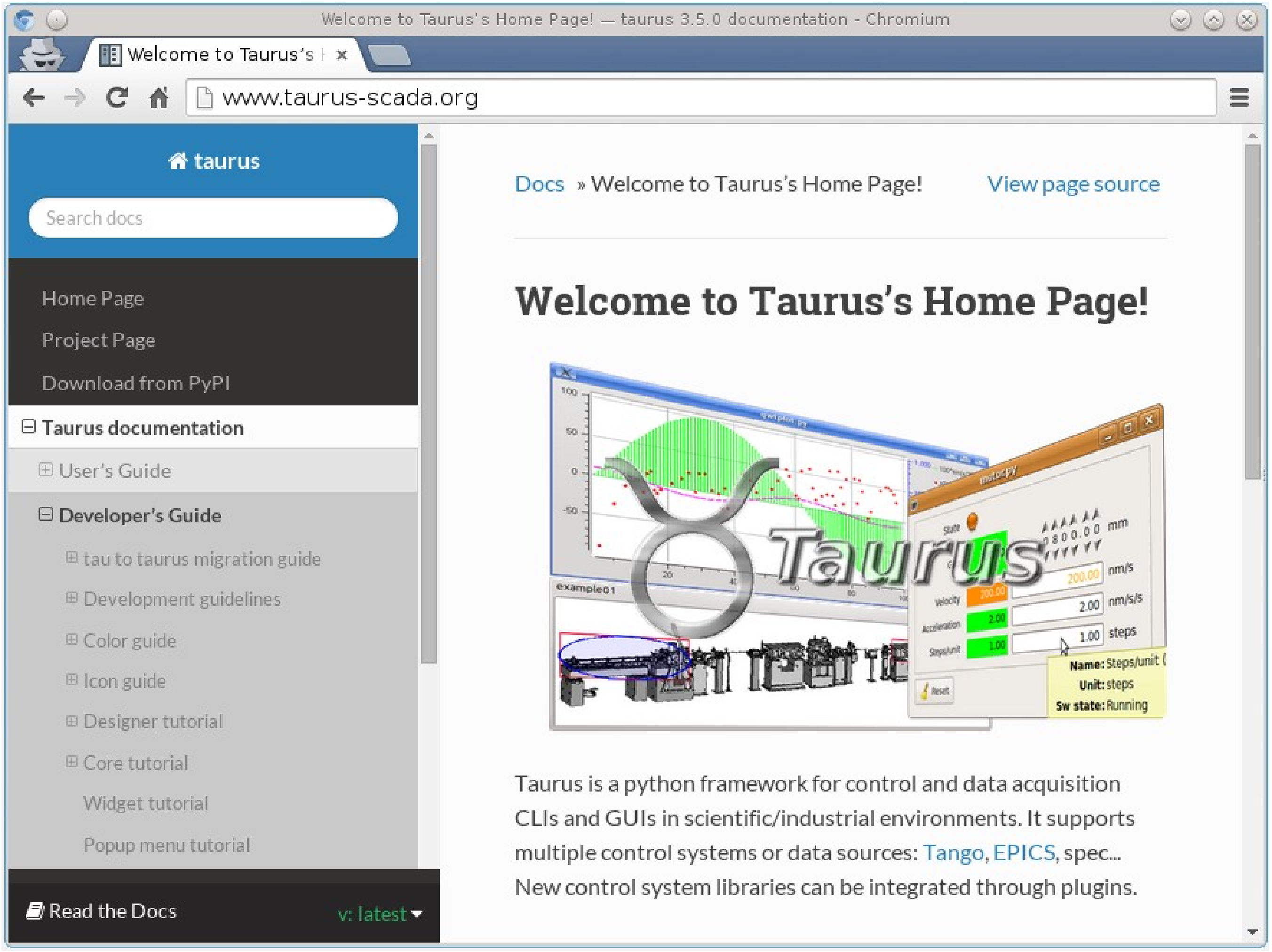


Home Page

http://www.taurus-scada.org

Access to:

- Documentation
- Releases
- Git repository
- Mailing lists
- Bugs & Requests tracker
- Enhancement Proposals
- ...



Welcome to Taurus's Home Page! — taurus 3.5.0 documentation - Chromium

www.taurus-scada.org

Welcome to Taurus's Home Page!

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