

### Sardana & Taurus Status





Zbigniew Reszela & Carlos Pascual (Alba Synchrotron, Spain) on behalf of Sardana & Taurus Communities

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### **Taurus?**



Taurus is a framework for building control and data acquisition CLIs and GUIs

It is based on Python and extends PyQt

It supports plugins for various control systems (Tango, EPICS,...) or data sources

```
(HDF5, Python eval,...)
```

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### Sardana?



Sardana is a SCADA for scientific installations originally developed at ALBA.

It is built on top of **Taurus** and **PyTango**.

It provides **automation** of procedures and **synchronization** in a distributed control system.

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### Sardana & Taurus Communities



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News since last Tango Meeting:

- Two releases: 2.3.2 and 2.4.0
- Update on Continuous Scans
- General Hooks
- Centralized Logging with Elastic
- Macro Logging for Users
- Element references are URIs
- Coming Soon:
  - Jul18 release and Jan19 release
  - Improve 1D and 2D experimental channels integration
  - 3<sup>rd</sup> Party Repository → Plugins Register



- Released one year ago with a set of standard macros underpinned by the measurement group configuration allowing software and hardware synchronization in time and position domains.
- New macros were added for timescan and meshct. Thanks to Roberto Homs!
- Interface for developing custom scans with arbitrary waypoints and synchronization description is missing.
- Results from ALBA setups presented on ICALEPCS 2017 – WEBPL06:
  - Experiment time reduction from several hours to few minutes.
  - **Standardized solutions** lower maintenance cost.



ascanct, a2scanct, a3scanct, a4scanct, dscanct, d2scanct, d3scanct, d4scanct, ...



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## Continuous Scans

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Step

Con-

Con-

	Scan	tinuous Scan 2013	tinuous Scan 2017
MSPD	~9 h	~42 min	~41 min
Angular range: 100°	26 min		45 s
Integration time: 25ms			
Intervals: 10000			
CLAESS	$\sim 1 h$	~3 min	~2 min
Energy range: 1keV	3 min		40 s
(8969 keV – 9969 keV)			
Integration time: 29 ms			
Intervals: 4000			
BOREAS	~1 h	~3 min	~2 min
(XMCD/XMLD)	25 min		
Energy range: 65 eV			
(755eV - 820eV)			
Integration time: 124ms			
Intervals: 4000			
BOREAS	$\sim \! 17 \min$	-	~6 min
(reflectivity)			30 s
Specular range: 47°			
Integration time: 0.2 s			
Intervals: 470			
Magnetic Field Map	~7 h	-	~4 min
Z axis range: 2.7 m	30 min		
Integration time: 0.06s			
Intervals: 2700			

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- What are hooks? Code that will be executed at given points of the macro.
- **Programmatic** and **graphical** way of attaching hooks was already possible.
- Now also possible by means of **persistent configuration** on different levels: global, door (session) or macro.
- Configuration via: 1sgh, defgh and udefgh
- Examples:
  - wait for optimal beam conditions in pre-acq e.g. check shutter, check current
  - data analysis in post-scan
- Thanks to Teresa Nuñez from DESY!

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```
import time
from sardana.macroserver.macro import macro

def hook(self):
   time.sleep(1)

@macro([["start", Type.Integer, None, "start point"],
      ["stop", Type.Integer, None, "end point"],
```

Macro:				
Macro	Parameters	Progress	Pause	-
ct ascan	[1.0] [mot_mx1, 0.0, 1000.0, 2, 0.1]	0%	]	
ascan ascan	Hook places	0%		•
senv ToothedTriangle	[ScanFile, scan2. [mot_mzr, 0.0, 10] post move	0%	] ]	•
	pre-acq			•
	🗌 post-acq			
	🗌 post-step			
	🗌 post-scan			

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### Centralized Logs with Elastic

- Servers log to multiple and distributed files.
- Debugging requires prior files merging :(
- Sardana does not use Tango logging but Python logging.



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### www.elastic.co

### HOW ELK WORK? (ARCHITECTURE)



Centralized Logs using ELK (Elasticsearch, Logstash, Kibana) Stack - Estu Fardani - FOSSASIA 2017

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www.sardana-controls.org www.taurus-scada.org

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### **Proof Of Concept**



TCP Logstash Handler

(Python Logging Handler) vklochan/python-logstash @ GitHub eht16/python-logstash-async @ GitHub

LogTrail Log Viewer plugin for Kibana sivasamyk/logtrail @ GitHub

Configuration examples: on reszelaz/sardana-elastic @ GitHub

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### Centralized Logs with Elastic

• Benefits: **remote log analysis**, performance indicators.

	LogTrail - Kibana		2001 2					
~	→ C ① ① elas	sticcontrols01.cells.es/app/logtrail#/2.g=0	🖊 🖸 🏠 🚺 🔽 🏄 🕴					
_	,	Hay 28 17:01:02,184 10.0402 HacroServer: DEBUG BL04/DOOR/05.Hacro[mythtake]: Executing macro: mythen_getOutDir	_					
	kibana	Hay 28 17.01:02,138 101002 March50rver: DEBUG BL04/D00R/05.Harch5xecutor: [START] runkarch Auchara and the second se						
	, Kibana	nay 28 1/201202/283 molesus macroserver: UEBU 60/2000/05 .macrosekector: Letu) 7 unmacro macro mychen_getourtur() -> none May 28 1/20120/286 influon Macroserver: DEBUG 10 4/2000/05 Akarofmychhadel: Execution macro: mychen getourtur() Ame						
~		Hay 28 17:01:02,238 ibl0402 HacroServer; DEBUG BL04/D00R/05.HacroExecutor: [STAR]] runHacro Hacro 'mythen_getOutFileHame() -> None'						
Ø	Discover	Hay 28 17:01:02,280 1110402 HacroServer: DEBUG BL04/D00R/05.HacroExecutor: [ END ] runHacro Hacro mythen_getOutFileHame() -> None						
1.1		Hay 28 1/101:02,283 1010402 MacroServer: bEBUG BL04/1000K/05. Macro[mythtake]: Executing macro: mythen_getindex May 28 1/101:02,283 1010402 MacroServer: DEBUG BL04/1000K/05. Macro[mythtake]: Executing macro: mythen_getindex						
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	Dashboard	Hay 28 17:01:02,319 1010002 HacroServers DEBUG BLok/DODR/05. Hacro[mythtake]: Executing macro: mythen_take						
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		Hay 28 17:01:02,405 ibl0402 HacroServer: DEBUG BL04/D00R/05.HacroExecutor: [ END ] runHacro Hacro 'mythen_setExtSignal(0, gate_out_active_high) -> None'						
1	LogTrail	Hay 28 17:01:02,407 ibl0402 MacroServer: DEBUG BL04/D00R/05.MacroExecutor: [START] runMacro Macro 'mythen_take(False, , ) -> None'						
_		Hay 28 1/101:02,412 1010002 Hacroserver: DEBUG 8104/1000(X), HacroServer(10)(YITTAKE).HacroServE						
سکر	Dev Tools	Hay 28 17:0.12;04 follow Hardress representation of the second structure of th						
		Hay 28 17:01:02,495 1610402 MacroServer: DEBUG BL04/D00R/05.Macro[mythtake].Macro[mythen_take]: Executing macro: mythen_acquire						
•	Management	Hay 28 17:01:02,497 ib10402 HacroServers DEBUG 81.04/DOBR/05.HacroSecutor: [START] runHacro Hacro'mythem acquire() -> None'						
		hay 20 17:01:02/199 Interver matrixet very ucous 0:09/1000/03/matrixet						
		Hay 28 17:01:02,531 ibl0402 HacroServer; DEBUG BL04/D00R/05.HacroExecutor: [ END ] runMacro Macro 'mythen_getPositions() -> None'						
		Hay 28 17:01:02,524 th10002 MacroServer: MarroServer: MacroServer: MacroServer: MacroServer: MacroServer: MarroServer: Mar						
		nay 28 1/2012/02/00/000000 macroserver: UEBU 60/2000/00. hacrojufyrntakej.macrojnyrner_ta						
		Hay 28 17:01:02,665 MIO402 Pool INFO motor/eb inpo ctrl/03: write Position(-40.0)						
		Hay 28 17:01:02,648 1110402 Pool: DEBUG pd_nc: Start motion user=-40.000000, dial=109.683875, backlash? False, dial_backlash=109.683875						
		Hay 28 1/501:02,657 h10:002 Pools 10+0 Controller.en_1pap.ctrl: noveholtiple: [(43, 87/471L)] Hay 28 1/501:02 657 h10:002 Pools 10+001 on controller.en_1pap.ctrl: noveholtiple: [(43, 87/471L)]						
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		Hay 28 17:01:03,915 1110002 Pool: INFO motor/eh_ipap_ctrl/43: write_Position(-40.35)						
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		Hay 28 17:01:03,926 interve becaute the company of						
		Hay 28 17:01:04,421 ibl0402 Pool: DEBUG pd_nc: Stopped						
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		Hay 28 17:01:05,605 ibl0402 HacroServer; DEBUG BL04/D00R/05.Hacro[mythtake].Hacro[mythen_take].Hacro[nythen_acquire]: StdErr: 100.00 %						
		Hay 22 17.01:05,666 ib10402 HarroServer: 0UTPUT BL04/0008/05. Hacro[aythtake]. Hacro[aythen_take]. Hacro[a						
		hay $25$ 17:01:05,007 interest matrix provide the second						
		Hay 28 17:01:05,610 Ib10402 HacroServer: DEBUG BL04/D00R/05.Hacro[mythtake].Hacro[nythen_take].Hacro[nythen_take].Eacro[nythen_take].Hacro[nythen_						
		Hay 28 17-01-05 Gol1 1010029 Has Resource Deputy Red 4/0000/05 Has research Deputy Red 4/0000/05 Has researc						
		nay 22 17/01/02/07/10/02/02 and coserver: public BU/9/000/95.http://doi.org/10.101/02/02/02/02/02/02/02/02/02/02/02/02/02/						
		Hay 28 17:01:05,660 1010402 HacroServer: DEBUG BL04/D00K/05.HacroExecutor: INTAKI) runhacro Hacro "nythen geturtileName() -> None"						
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		bis Bodana*						
0	Collapse	"access denied" 1.2.3.4 -sshd Uses lucene query syntax Search All Systems bi04.sardana*						

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### **Centralized Logs with Elastic**

• Benefits: remote log analysis, performance indicators.



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### ALBA Macro Logging for Users

- Macros may provide information via logging streams.
- Users requires this information to be stored in a file as they see it in spock.
- Implementation:
  - File log handler attached to the MacroServer
  - logmacro macro and LogMacroFormat, LogMacroDir environment variables.
- Thanks to Teresa Nuñez from DESY!

		emacs@	nasp029rack	.desy.de (o	n hasp029ra	ck)	-	o x
File Edit	Options E	Buffers Tools	Help					
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-:	session p	06 door has	p029rack.01	.log All	L1 (Fun	damental)		t
For inf	formation	about GNU E	macs and th	e GNU syste	m, type C-h	C-a.		

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- How elements refers to each other?
- Previously: host:port/element/controller/axis myhost:10000/motor/icepap01/7
- Now:

scheme://host[.domain]:port/element/controller/axis
tango://myhost.mydomain:10000/motor/icepap01/7

• Compatibility with Taurus 4



- How elements refers to each other?
- Previously: host:port/element/controller/axis myhost:10000/motor/icepap01/7
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scheme://host[.domain]:port/element/controller/axis
tango://myhost.mydomain:10000/motor/icepap01/7

• Compatibility with Taurus 4



- How elements refers to each other?
- Previously: host:port/element/controller/axis myhost:10000/motor/icepap01/7
- NOW: scheme://host[.domain]:port/element/controller/axis tango://myhost.mydomain:10000/motor/icepap01/7
- Compatibility with Taurus 4





- **SEP2** will be inspired on Lima but not limited to Lima.
- Configuration: saving (also per experiment configuration); image e.g. ROI, binning, etc.
- Acquisition will be possible on different levels: channel, measurement group, scan.
  - Prior work on synchronization and acquisition are described in SEP18.
- Saving:
  - Done externally e.g. controller, Lima or directly the detector; reference to the image will be passed to the recorders.
  - Image will be passed via Tango events and saving will be done internally by the recorders.



- Plugins: controllers, macros, recorders, widgets/GUIs.
- Currently controllers and macros are in a **unique Git repo** on www.sf.net
- SEP16
- Objectives:
  - Enable natural way of working using Git (or other VCS).
  - Do not impose the repository organization.
  - Enable the possibility to use project tools: issue trackers, wikis, ...
  - Do not force the hosting platform.
  - Give visibility to the well maintained plugins.
- Idea:
  - Plugins repositories will have their **own admins**.
  - Sardana org. will **advice** on how to organize the plugin projects.
  - Sardana org. will maintain the register of third party plugins.





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- News since last Tango meeting
  - Documentation: travis-generated docs and wiki
  - Taurus formatter API
  - (slow) Progress in PyQtgraph-based plots (TEP17)
  - Other works in progress:
    - python3 support
    - TEP15
    - Tango event serialization

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• Taurus docs are now generated by Travis and served by githup pages





### Requirement:

- We want to specify the format with which numerical quantities are displayed by the Taurus widgets (note: Taurus 3 used the "tango format" field for displaying the attribute value)

#### • Problem:

- The "format" should be a property of the **view** (widget) not of the **model** (attribute).
- Also, it is not scheme-agnostic
- Solution:
  - Taurus **attributes** define a *precision* property (number of meaningful decimal places)
  - Taurus **widgets** display the value using a given *Formatter* (which can be either a format string or a method that returns a format string).
  - The *defaultFormatter* uses the attribute precision for the numerical values
  - The taurus TangoAttribute infers the precision from the "tango config format"
  - The Tango scheme provides a tangoFormatter which uses the full "tango config format"
  - The Formatter can be set programmatically or (for some widgets) via a context menu



### Consider a Tango Attribute whose value is 123.45 V



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- TEP17 (https://github.com/taurus-org/taurus/pull/452). Goal: provide pyqtgraph, tool-based replacement for:
  - TaurusPlot (PyQwt)
  - TaurusTrend (PyQwt)
  - TaurusImageDialog (guiqwt)
  - TaurusTrend2DDialog (guiqwt)
  - Planned for release **Jan18** but <u>stalled</u>
  - Implemented as a **plugin for taurus**:

http://github.com/taurus-org/taurus\_pyqtgraph

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## Taurus\_pyqtgraph (done)

- Taurus data items (taurus-aware data items attachable to generic pyqtgraph plots):
  - TaurusPlotDataltem
  - TaurusTrendSet
  - TaurusImageItem
- Tools (independent "tools" attachable to generic pyqtgraph plots to extend them)
  - Model Chooser Tools (allow the user to select taurus models):
    - TaurusModelChooserTool, (for selecting a list of models)
    - TaurusImageModelChooserTool, (for selecting a single model)
    - TaurusXYModelChooserTool (for selecting a list of X and Y models + titles)
  - DateAxisItem (provides an axis that supports date/time )
  - Y2ViewBox (provides a secondary Y axis)
  - CurvesPropertiesTool (allows the user to change curve color, symbol, width,...)
  - AutoPanTool (provides "oscilloscope mode" auto-panning for trends)
  - ForcedReadTool (provides user-selectable client-side polling)
  - **PlotLegendTool** (allows the user to show/hide a legend)
- High-level widgets (stand-alone, taurus-aware, save/restore config support,...):
  - TaurusPlot
  - TaurusTrend (WIP)

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## Taurus\_pyqtgraph



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### Taurus\_pyqtgraph (done)



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## Taurus\_pyqtgraph (missing)

- 1D trends
  - add/remove trends in high-level widget is still buggy
  - archiving support (should be provided by archivingscheme)
- 2D plots
  - high-level widget not started
- 2D trends
  - not started



(See complete feature list in taurus\_pyqtgraph README )

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### **Other works-in-progress**

- Support of Python3 (PR #680, #703)
  - First steps done (thanks MaxIV and @piertoni !)
- TEP15 (use URI fragments to reference value slices)
  - please help decide the syntax!
- Support tango.DevEnum (Issue #742)
- Manage the tango event queue in Taurus (PR #738)



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- Sardana & Taurus Workshop (beginners) at ICALEPCS 2017 – sardana-org/sardana-training @ GitHub
- Sardana & Taurus Workshop at Tango Meeting 2018 Thanks to all Participants and Tango Meeting Organizers!
- Sardana Follow-up Meetings sardana-org/sardanafollowup @ GitHub.
   Thanks to Grzegorz Kowalski (Solaris), Antonio Milan (MaxIV) and Teresa Nuñez (DESY)!
- Sardana Docs Camp July 2018 in Barcelona

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# Thanks to the Community!

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