Sardana Status

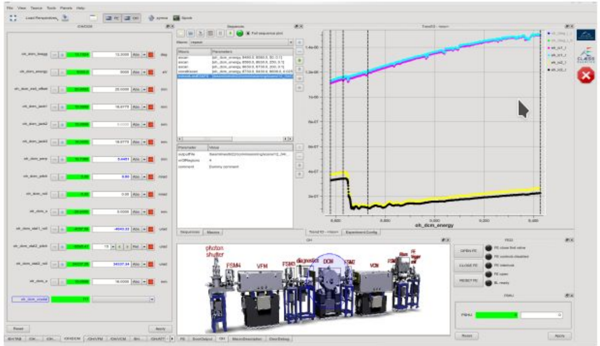
by Teresa Núñez (DESY), Benjamin Bertrand and Johan Forsberg (MAXIV), Michał Piekarski (SOLARIS), and Martí Caixal, Jordi Aguilar, and **Zbigniew Reszela** (ALBA)
on behalf of the **Sardana Community**

37th Tango Community Meeting 2023, 27-29.06.2023

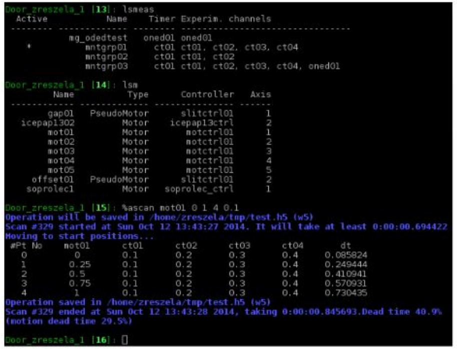
Agenda

- New major enhancements:
    - System configuration
    - Debugging and recovery
- Improvements in user and developer experience
- Sardana Community

What is Sardana?



Taurus based GUIs



```
Door_zreszela_1 [13]: lsmeas
  Active             Name    Timer Experim. channels
 -------- -------------- -------- ----------------------------------
              mg_odedtest   oned01 oned01
    *           mntgrp01     ct01 ct01, ct02, ct03, ct04
                mntgrp02     ct01 ct01, ct02
                mntgrp03     ct01 ct01, ct02, ct03, ct04, oned01

Door_zreszela_1 [14]: lsm
         Name          Type       Controller   Axis
 ----------- ------------ ---------------- ------
        gap01   PseudoMotor       slitctrl01      1
   icepap1302         Motor    icepap13ctrl      2
        mot01         Motor        motctrl01      1
        mot02         Motor        motctrl01      2
        mot03         Motor        motctrl01      3
        mot04         Motor        motctrl01      4
        mot05         Motor        motctrl01      5
     offset01   PseudoMotor       slitctrl01      2
    soprolec1         Motor    soprolec_ctrl      1

Door_zreszela_1 [15]: %ascan mot01 0 1 4 0.1
Operation will be saved in /home/zreszela/tmp/test.h5 (w5)
Scan #329 started at Sun Oct 12 13:43:27 2014. It will take at least 0:00:00.694422
Moving to start positions...
 #Pt No    mot01      ct01      ct02      ct03      ct04       dt
   0        0         0.1       0.2       0.3       0.4     0.085824
   1       0.25       0.1       0.2       0.3       0.4     0.249444
   2       0.5        0.1       0.2       0.3       0.4     0.410941
   3       0.75       0.1       0.2       0.3       0.4     0.570931
   4        1         0.1       0.2       0.3       0.4     0.730435
Operation saved in /home/zreszela/tmp/test.h5 (w5)
Scan #329 ended at Sun Oct 12 13:43:28 2014, taking 0:00:00.845693.Dead time 40.9%
(motion dead time 29.5%)

Door_zreszela_1 [16]: 
```

Spock – IPython based CLI

Scientific SCADA Suite

Suite = Sardana & Taurus projects

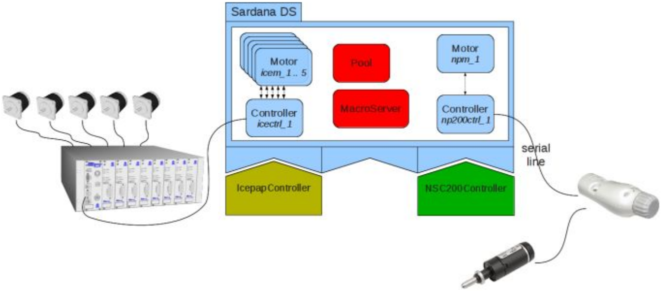
100 % Python

Built on top of Tango CS

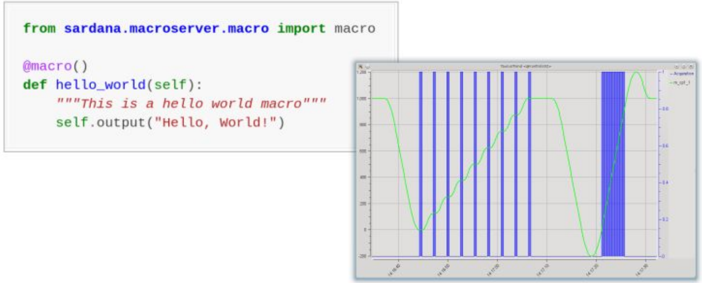
Extendable with plugins

Configure, don't program!

Device Pool – HW access + low level control



MacroServer – powerful sequencer



```python
from sardana.macroserver.macro import macro

@macro()
def hello_world(self):
    """This is a hello world macro"""
    self.output("Hello, World!")
```

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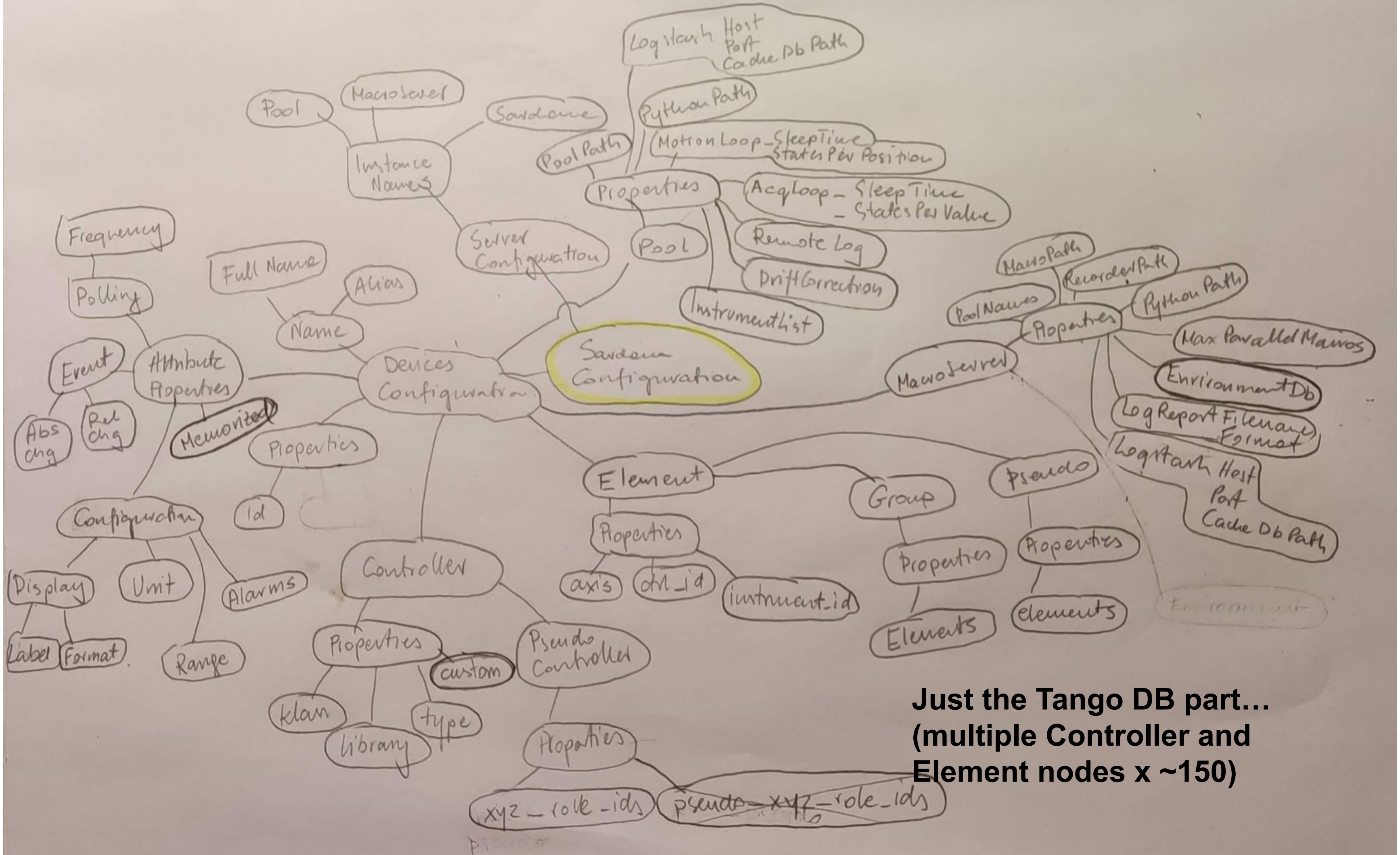
Sardana config - motivation

- Sardana has **multiple configuration points** in Tango DB, environment DB and sardanacustomsettings.
- Different institutes developed their own and **custom solutions** for configuration
- Sardana is usually configured **dynamically**, while running:
    - things can **change** at any time, sometimes by mistake
    - things tend to **stay around,** e.g. disconnected equipment
- This leads to accidental **complexity** and is hard to **troubleshoot** and **track changes**
- **The solution must be easy and intuitive to edit and browse the Sardana configuration and track historical changes**

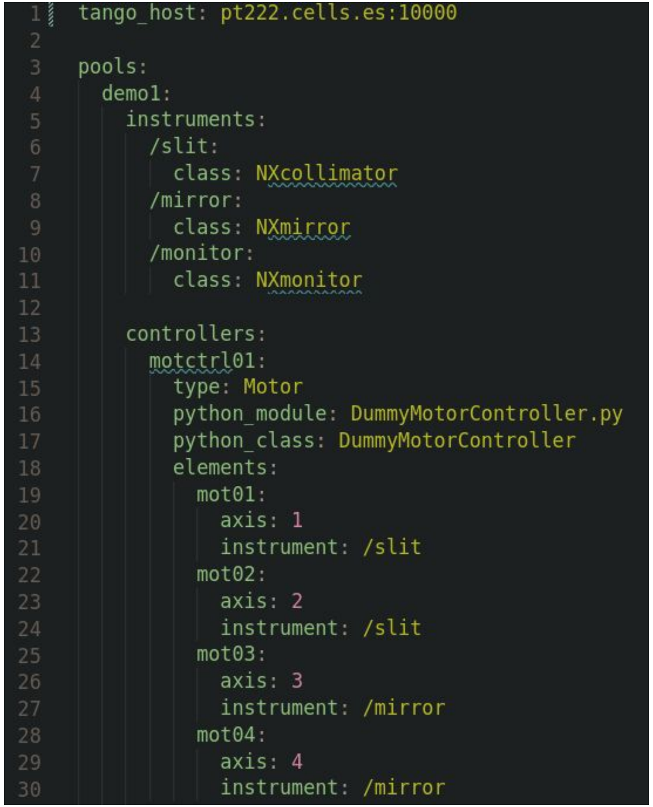


**Just the Tango DB part…
(multiple Controller and
Element nodes x ~150)**

Sardana config - YAML format

The “config tool” coexists with dynamic config, but can help:

- Maintain **several different setups** using separate YAML files with only relevant, working, stuff.
- Text based format can be **version controlled**; know **what** changed, **when** and by **who**.
- YAML supports **comments**, making the configuration more "self documenting".
- The YAML format follows Sardana's **logical structure** and makes the system more "readable".



```yaml
tango_host: pt222.cells.es:10000

pools:
  demo1:
    instruments:
      /slit:
        class: NXcollimator
      /mirror:
        class: NXmirror
      /monitor:
        class: NXmonitor

    controllers:
      motctrl01:
        type: Motor
        python_module: DummyMotorController.py
        python_class: DummyMotorController
        elements:
          mot01:
            axis: 1
            instrument: /slit
          mot02:
            axis: 2
            instrument: /slit
          mot03:
            axis: 3
            instrument: /mirror
          mot04:
            axis: 4
            instrument: /mirror
```

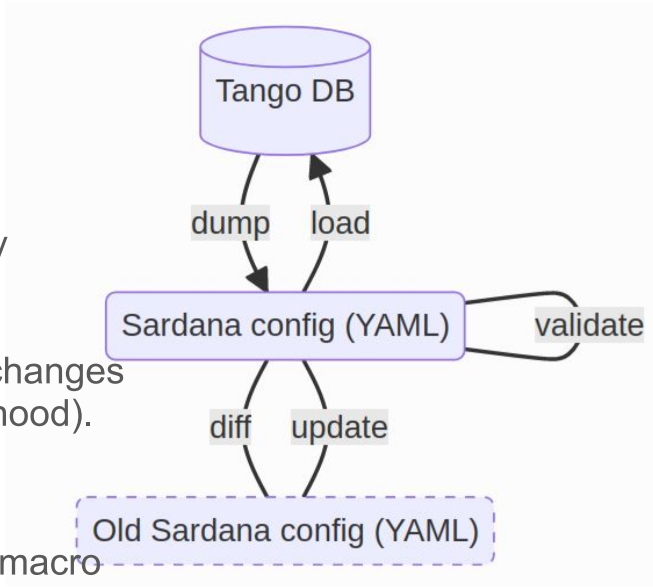
Sardana config - how does it work?

A set of **commands** that handle sardana configuration "offline".

Low level tool, intended for somewhat technical users.

```
$ sardana config --help
```

- **Define** your "whole" sardana configuration in a YAML file, either by **dump**ing from an existing system, or writing it from scratch.
- **Validate** the YAML file, to catch common errors.
- **Diff** the YAML file against other files or the current system to see changes
- **Load** the config file into the Tango db (using “dsconfig” under the hood).



Note: changes don't take effect until Sardana is **restarted** (or "reconfig" macro is run).

Sardana config - current status

Only MVP feature implemented, not in general use yet (but please try it!)

Some missing features that are planned:

- Support for sardana **environment variables**
- Support for **modular** configuration (several YAML files combined)
- Better **validation**
- Future: Higher level "workflow" commands?
- Future: GUI?

Thanks to Johan Forsberg from MAXIV!

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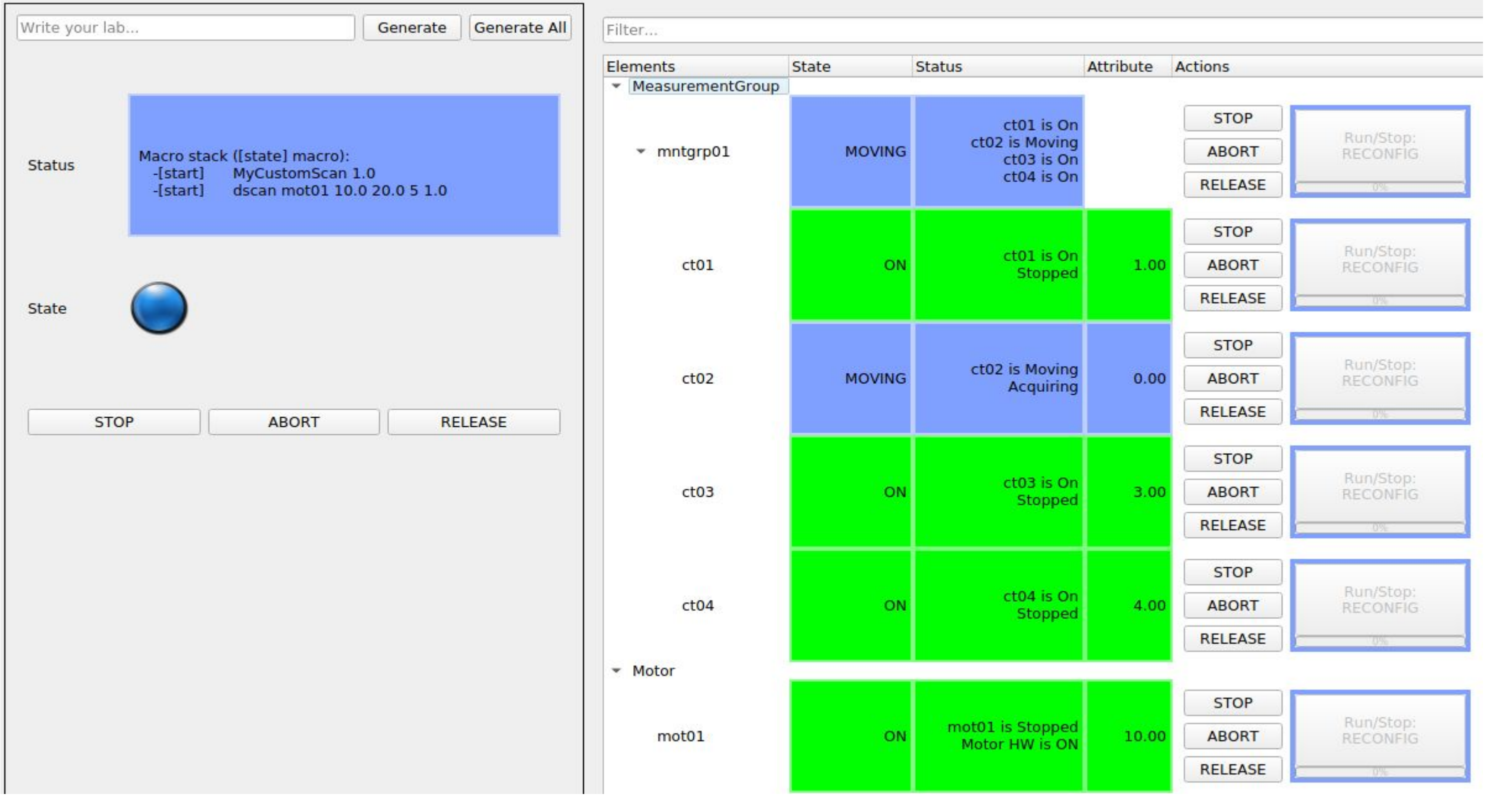
Debugging - status widget



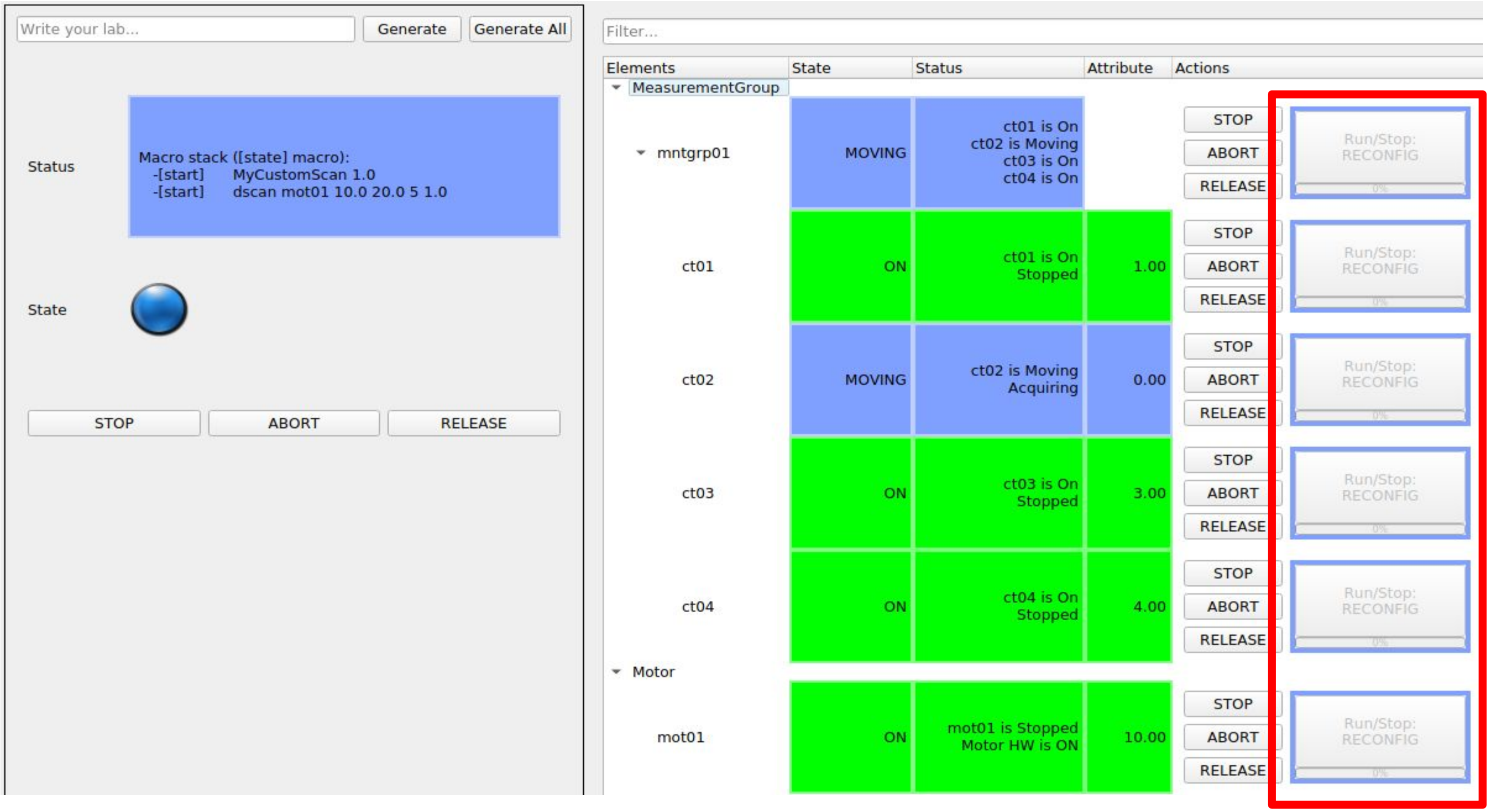
Status

```
Macro stack ([state] macro):
  -[start]     MyCustomScan 1.0
  -[start]     dscan mot01 10.0 20.0 5 1.0
```

State ●

Elements	State	Status	Attribute	Actions
MeasurementGroup				
mntgrp01	MOVING	ct01 is On ct02 is Moving ct03 is On ct04 is On		STOP ABORT RELEASE Run/Stop: RECONFIG 0%
ct01	ON	ct01 is On Stopped	1.00	STOP ABORT RELEASE Run/Stop: RECONFIG 0%
ct02	MOVING	ct02 is Moving Acquiring	0.00	STOP ABORT RELEASE Run/Stop: RECONFIG 0%
ct03	ON	ct03 is On Stopped	3.00	STOP ABORT RELEASE Run/Stop: RECONFIG 0%
ct04	ON	ct04 is On Stopped	4.00	STOP ABORT RELEASE Run/Stop: RECONFIG 0%
Motor				
mot01	ON	mot01 is Stopped Motor HW is ON	10.00	STOP ABORT RELEASE Run/Stop: RECONFIG 0%

Recovery - reconfig macro



Status

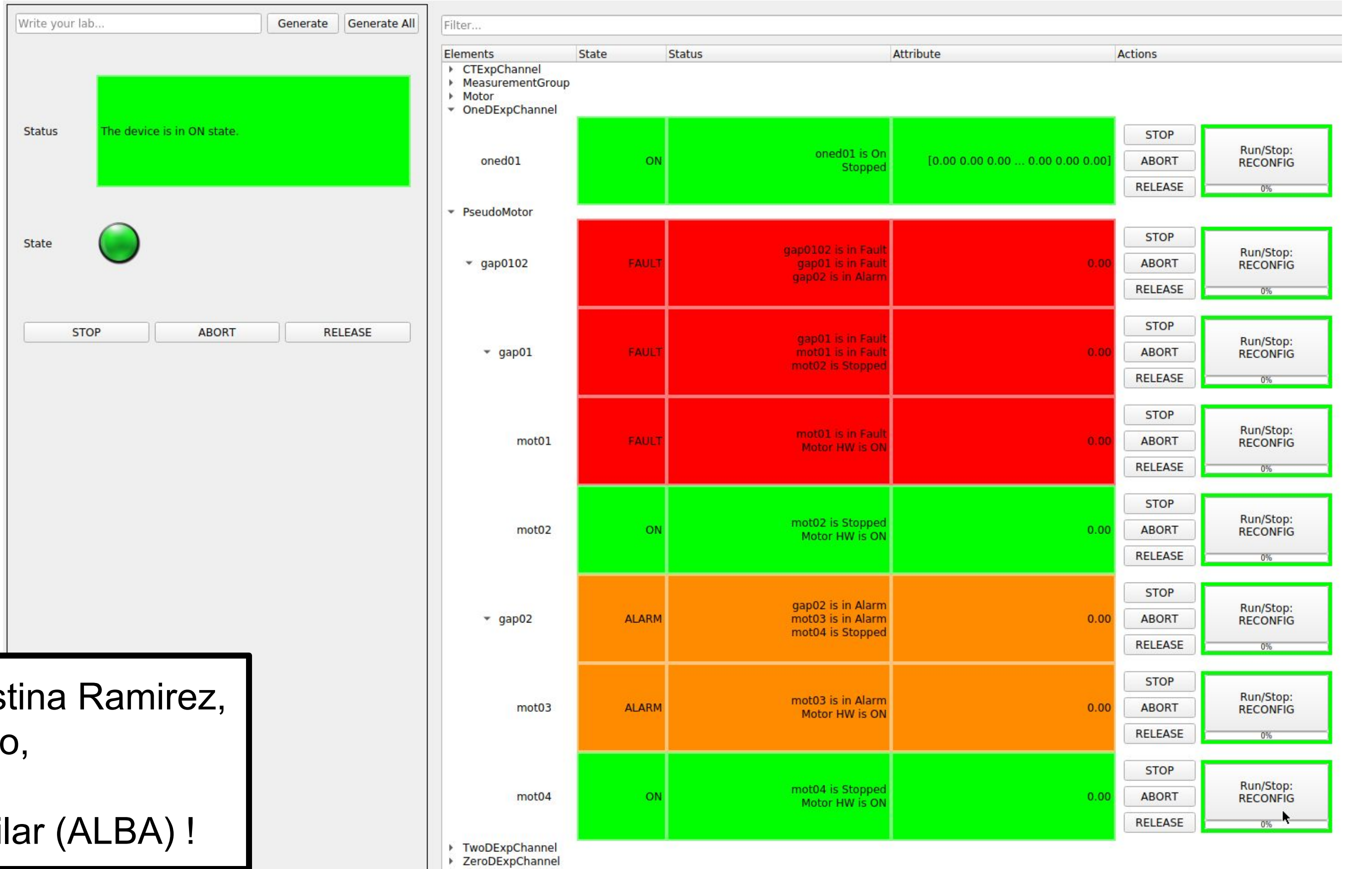
Macro stack ([state] macro):
-[start] MyCustomScan 1.0
-[start] dscan mot01 10.0 20.0 5 1.0

State

Elements	State	Status	Attribute	Actions
MeasurementGroup				
mntgrp01	MOVING	ct01 is On ct02 is Moving ct03 is On ct04 is On		STOP ABORT RELEASE Run/Stop: RECONFIG 0%
ct01	ON	ct01 is On Stopped	1.00	STOP ABORT RELEASE Run/Stop: RECONFIG 0%
ct02	MOVING	ct02 is Moving Acquiring	0.00	STOP ABORT RELEASE Run/Stop: RECONFIG 0%
ct03	ON	ct03 is On Stopped	3.00	STOP ABORT RELEASE Run/Stop: RECONFIG 0%
ct04	ON	ct04 is On Stopped	4.00	STOP ABORT RELEASE Run/Stop: RECONFIG 0%
Motor				
mot01	ON	mot01 is Stopped Motor HW is ON	10.00	STOP ABORT RELEASE Run/Stop: RECONFIG 0%

Issue with DevRestart() command fixed - thanks to Reynald (ESRF) and Michal (S2Innovation): cppTango#888

Elements browsing and relationships - status widget



Status: The device is in ON state.

State: ●

STOP ABORT RELEASE

Elements	State	Status	Attribute	Actions
CTExpChannel				
MeasurementGroup				
Motor				
OneDExpChannel				
oned01	ON	oned01 is On Stopped	[0.00 0.00 0.00 ... 0.00 0.00 0.00]	STOP ABORT RELEASE Run/Stop: RECONFIG 0%
PseudoMotor				
gap0102	FAULT	gap0102 is in Fault gap01 is in Fault gap02 is in Alarm	0.00	STOP ABORT RELEASE Run/Stop: RECONFIG 0%
gap01	FAULT	gap01 is in Fault mot01 is in Fault mot02 is Stopped	0.00	STOP ABORT RELEASE Run/Stop: RECONFIG 0%
mot01	FAULT	mot01 is in Fault Motor HW is ON	0.00	STOP ABORT RELEASE Run/Stop: RECONFIG 0%
mot02	ON	mot02 is Stopped Motor HW is ON	0.00	STOP ABORT RELEASE Run/Stop: RECONFIG 0%
gap02	ALARM	gap02 is in Alarm mot03 is in Alarm mot04 is Stopped	0.00	STOP ABORT RELEASE Run/Stop: RECONFIG 0%
mot03	ALARM	mot03 is in Alarm Motor HW is ON	0.00	STOP ABORT RELEASE Run/Stop: RECONFIG 0%
mot04	ON	mot04 is Stopped Motor HW is ON	0.00	STOP ABORT RELEASE Run/Stop: RECONFIG 0%
TwoDExpChannel				
ZeroDExpChannel				

Thanks to Cristina Ramirez,
Miquel Navarro,
Marti Caixal
and Jordi Aguilar (ALBA) !

Agenda

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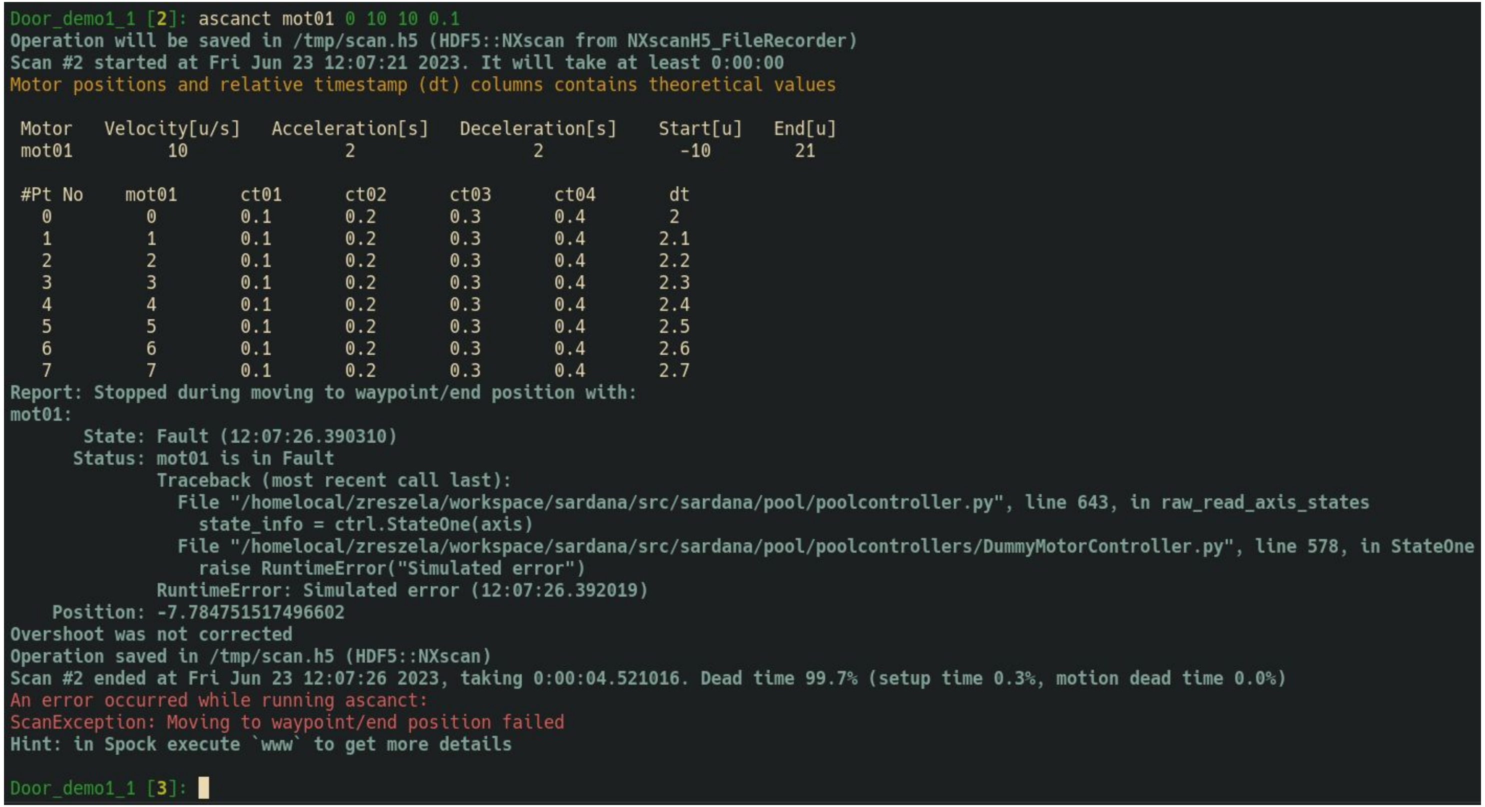
- Improvements in user and developer experience
- Community events

Improving user experience: feedback & error messages

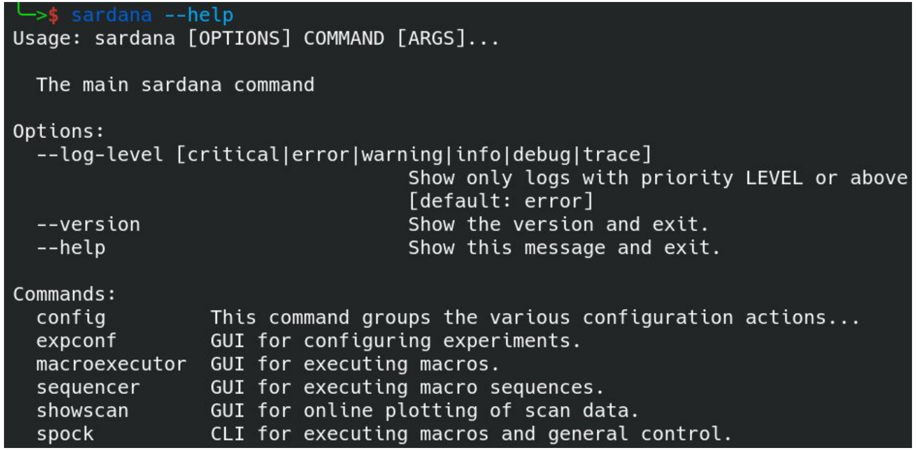


```
Door_demo1_1 [2]: ascanct mot01 0 10 10 0.1
Operation will be saved in /tmp/scan.h5 (HDF5::NXscan from NXscanH5_FileRecorder)
Scan #2 started at Fri Jun 23 12:07:21 2023. It will take at least 0:00:00
Motor positions and relative timestamp (dt) columns contains theoretical values

 Motor   Velocity[u/s]   Acceleration[s]   Deceleration[s]    Start[u]   End[u]
 mot01        10                2                  2             -10       21

 #Pt No    mot01      ct01      ct02      ct03      ct04       dt
   0         0        0.1       0.2       0.3       0.4        2
   1         1        0.1       0.2       0.3       0.4       2.1
   2         2        0.1       0.2       0.3       0.4       2.2
   3         3        0.1       0.2       0.3       0.4       2.3
   4         4        0.1       0.2       0.3       0.4       2.4
   5         5        0.1       0.2       0.3       0.4       2.5
   6         6        0.1       0.2       0.3       0.4       2.6
   7         7        0.1       0.2       0.3       0.4       2.7
Report: Stopped during moving to waypoint/end position with:
mot01:
       State: Fault (12:07:26.390310)
      Status: mot01 is in Fault
              Traceback (most recent call last):
                File "/homelocal/zreszela/workspace/sardana/src/sardana/pool/poolcontroller.py", line 643, in raw_read_axis_states
                  state_info = ctrl.StateOne(axis)
                File "/homelocal/zreszela/workspace/sardana/src/sardana/pool/poolcontrollers/DummyMotorController.py", line 578, in StateOne
                  raise RuntimeError("Simulated error")
              RuntimeError: Simulated error (12:07:26.392019)
    Position: -7.784751517496602
Overshoot was not corrected
Operation saved in /tmp/scan.h5 (HDF5::NXscan)
Scan #2 ended at Fri Jun 23 12:07:26 2023, taking 0:00:04.521016. Dead time 99.7% (setup time 0.3%, motion dead time 0.0%)
An error occurred while running ascanct:
ScanException: Moving to waypoint/end position failed
Hint: in Spock execute `www` to get more details

Door_demo1_1 [3]:
```

Improving user experience: unified sardana CLI

`sardana` - single point of access with sub-commands:

- `spock -> sardana spock`
- `macroexecutor -> sardana macroexecutor`
- `sequencer -> sardana sequencer`
- `showscan -> sardana showscan`
- NEW: `sardana expconf`
- NEW: `sardana config`
- COMING SOON: `sardana status`



```
└─>$ sardana --help
Usage: sardana [OPTIONS] COMMAND [ARGS]...

  The main sardana command

Options:
  --log-level [critical|error|warning|info|debug|trace]
                                  Show only logs with priority LEVEL or above
                                  [default: error]
  --version                       Show the version and exit.
  --help                          Show this message and exit.

Commands:
  config         This command groups the various configuration actions...
  expconf        GUI for configuring experiments.
  macroexecutor  GUI for executing macros.
  sequencer      GUI for executing macro sequences.
  showscan       GUI for online plotting of scan data.
  spock          CLI for executing macros and general control.
```

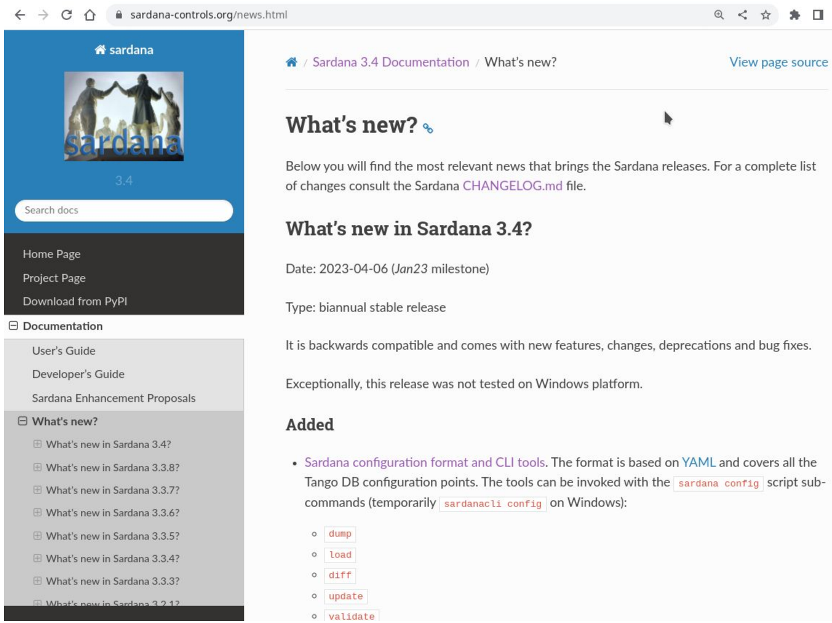
Pending - server executables*:

- `Pool -> sardana server --pool`
- `MacroServer -> sardana server --macro`
- `Sardana -> sardana server`

*issue with Starter - https://gitlab.com/tango-controls/starter/-/issues/20

Improving user experience: documentation

What’s new - user friendly CHANGELOG.


sardana-controls.org/news.html
sardana
sardana
3.4
Search docs
Home Page
Project Page
Download from PyPI
Documentation
User’s Guide
Developer’s Guide
Sardana Enhancement Proposals
What’s new?
What’s new in Sardana 3.4?
What’s new in Sardana 3.3.8?
What’s new in Sardana 3.3.7?
What’s new in Sardana 3.3.6?
What’s new in Sardana 3.3.5?
What’s new in Sardana 3.3.4?
What’s new in Sardana 3.3.3?
What’s new in Sardana 3.2.1?
Sardana 3.4 Documentation / What’s new?
View page source

What’s new?

Below you will find the most relevant news that brings the Sardana releases. For a complete list of changes consult the Sardana CHANGELOG.md file.

What’s new in Sardana 3.4?

Date: 2023-04-06 (*Jan23* milestone)

Type: biannual stable release

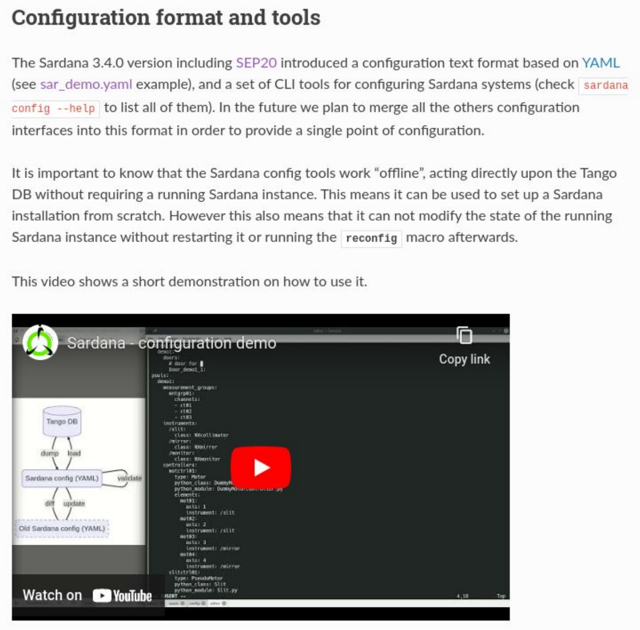
It is backwards compatible and comes with new features, changes, deprecations and bug fixes.

Exceptionally, this release was not tested on Windows platform.

Added

- Sardana configuration format and CLI tools. The format is based on YAML and covers all the Tango DB configuration points. The tools can be invoked with the `sardana config` script sub-commands (temporarily `sardanacli config` on Windows):
  - `dump`
  - `load`
  - `diff`
  - `update`
  - `validate`

Video tutorials embedded in the docs.



Configuration format and tools

The Sardana 3.4.0 version including SEP20 introduced a configuration text format based on YAML (see sar_demo.yaml example), and a set of CLI tools for configuring Sardana systems (check `sardana config --help` to list all of them). In the future we plan to merge all the others configuration interfaces into this format in order to provide a single point of configuration.

It is important to know that the Sardana config tools work “offline”, acting directly upon the Tango DB without requiring a running Sardana instance. This means it can be used to set up a Sardana installation from scratch. However this also means that it can not modify the state of the running Sardana instance without restarting it or running the `reconfig` macro afterwards.

This video shows a short demonstration on how to use it.

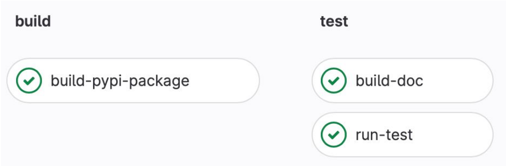
```
  demo1:
    doors:
      # door for
      Door_demo1_1:
pools:
  demo1:
    measurement_groups:
      mntgrp01:
        channels:
        - ct01
        - ct02
        - ct03
    instruments:
      /slit:
        class: NXcollimator
      /mirror:
        class: NXmirror
      /monitor:
        class: NXmonitor
    controllers:
      motctrl01:
        type: Motor
        python_class: DummyM
        python_module: DummyMotorController.py
        elements:
          mot01:
            axis: 1
            instrument: /slit
          mot02:
            axis: 2
            instrument: /slit
          mot03:
            axis: 3
            instrument: /mirror
          mot04:
            axis: 4
            instrument: /mirror
      slitctrl01:
        type: PseudoMotor
        python_class: Slit
        python_module: Slit.py
```

Thanks to Tango for hosting our videos on @tango-controls (YT)

Improving developer experience: refactoring of CI

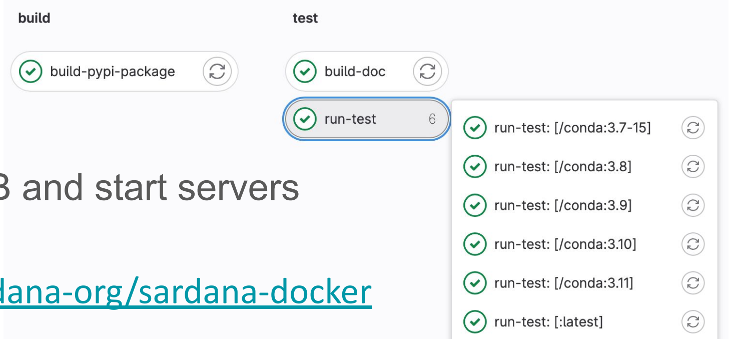
Before

- One all-in-one docker image (3.6 GB) based on Debian 9
- Only one python version tested
- Tango DB pre-populated



Now

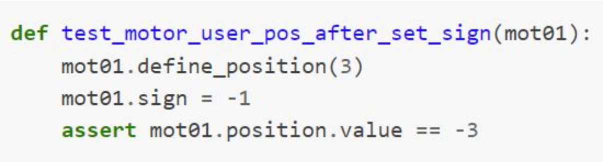
- New images (2GB) based on mambaorg/micromamba (Python 3.7 to 3.11)
- Using GitLab CI services to start mysql and tango-db
- New **create_sar_demo** pytest fixture to populate Tango DB and start servers
- Easy to update and tests new images
- Extra: docker-compose to run locally: https://gitlab.com/sardana-org/sardana-docker



Thanks to Benjamin Bertrand (MAXIV) and Wojciech Zaręba, Adrianna Pytel (SOLARIS)!

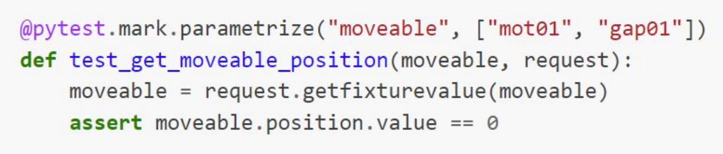
Improving developer experience: pytest core fixtures

- pytest provides a more pythonic and modular way of developing tests
- sardana built-in fixtures defined in ***sardana.pool.test*** for all basic elements e.g **mot01, ct01, motctrl01, …**



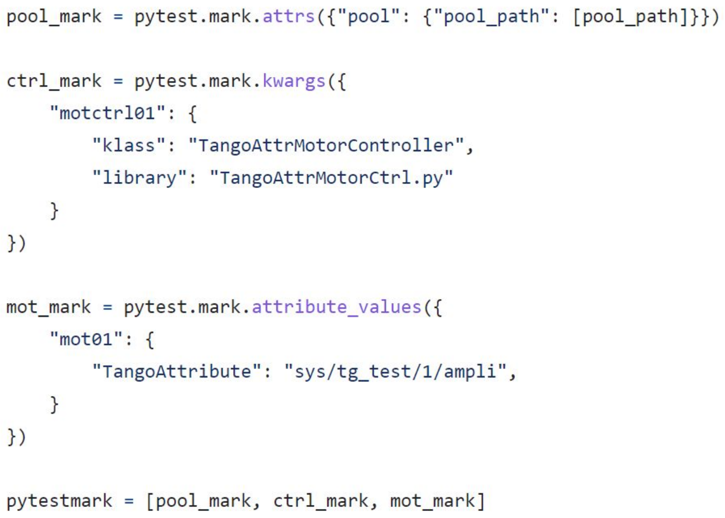
```python
def test_motor_user_pos_after_set_sign(mot01):
    mot01.define_position(3)
    mot01.sign = -1
    assert mot01.position.value == -3
```

- all built-in fixtures are off-the-shelf, highly customizable and allow creating complex test cases



```python
@pytest.mark.parametrize("moveable", ["mot01", "gap01"])
def test_get_moveable_position(moveable, request):
    moveable = request.getfixturevalue(moveable)
    assert moveable.position.value == 0
```

- core fixtures are so parameterizable that are suitable for controller (plugins) tests



```python
pool_mark = pytest.mark.attrs({"pool": {"pool_path": [pool_path]}})

ctrl_mark = pytest.mark.kwargs({
    "motctrl01": {
        "klass": "TangoAttrMotorController",
        "library": "TangoAttrMotorCtrl.py"
    }
})

mot_mark = pytest.mark.attribute_values({
    "mot01": {
        "TangoAttribute": "sys/tg_test/1/ampli",
    }
})

pytestmark = [pool_mark, ctrl_mark, mot_mark]
```

Thanks to Michał Piekarski (SOLARIS)!

Improving developer experience: packaging

pip

Before 3.4.0: pip3 install sardana

In 3.4.0, added **sardana[config]**

For > 3.4.0, new extras: **spock**, **qt**, **config**, **all**
"pip3 install sardana" will install pytango but not itango. You can use:

- pip3 install "sardana[spock]"
- pip3 install "sardana[spock,qt]"

"sardana[spock]" is equivalent to the sardana from before

conda

Before 3.4.0: conda install sardana

Since 3.4.0, **sardana** is a metapackage that includes:

- **sardana-core**
- **sardana-qt**
- **sardana-config**

Install only what you need!

Thanks to Benjamin Bertrand (MAXIV)!

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- Improvements in user and developer experience
- Community events

Sardana Community

- Active members**: DESY, MAXIV, MBI-Berlin, SOLARIS** and **ALBA**
- **Periodic** Sardana follow-up **meetings** for discussion about new developments and issues:
  - review of the kanban board
  - backlog refinement
- **Specific meetings** dedicated to concrete topics/tasks: bug solving, documentation, tools, new big features
- Remote **pair programming when needed**
- **Collaborative developments** e.g. SEP20, test fixtures

Community events

2022: 2nd Sardana Bug Squashing Party @ ALBA

- 22 participants from different institutes (14 local and 8 remote)
- pair-programming sessions
- 16 issues closed
- 18 MR finished

What's next?

- Continuous Scans Workshop @ SOLARIS
- Introduction to sardana macros during Tango Workshop @ ICALEPCS 2023

CONTINUOUS SCANS WORKSHOP
20th-21st September, SOLARIS, hybrid

- **sharing experience** in the field of continuous scans
- looking for **possible ways of collaboration**
- speakers of similar frameworks will contribute: **Bliss, Bluesky, Flyscan (to be confirmed), DESY, PSI and Diamond**
- discussion of possible solutions for Sardana continuous scans **missing features**
- roadmap for the eventual **enhancement projects**

We invite you to participate!

Sardana workshop (20-21 September 2023)

SOLARIS
NATIONAL SYNCHROTRON
RADIATION CENTRE

Thanks to Michał Piekarski (SOLARIS)!

Summary

- **Configuration**, **debugging and recovery** were significantly improved.
- We **continuously improve** user and developer experience.
- Soon we will evaluate the need for **enhancing continuous scans**.
- Tango is a solid base for Sardana and we are **grateful for the received support from the Tango Community!**
- All this was possible **thanks to the involvement of the Sardana Community**: DESY, MAXIV, MBI-Berlin, SOLARIS, S2Innovation and ALBA.

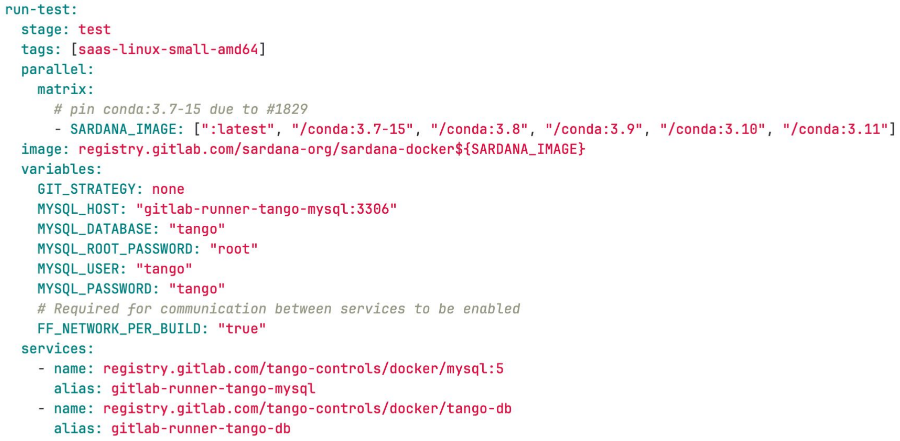
Thank you for your attention!

Improving developer experience: pytest Tango fixtures

CI improvements were made possible thanks to some test refactoring.

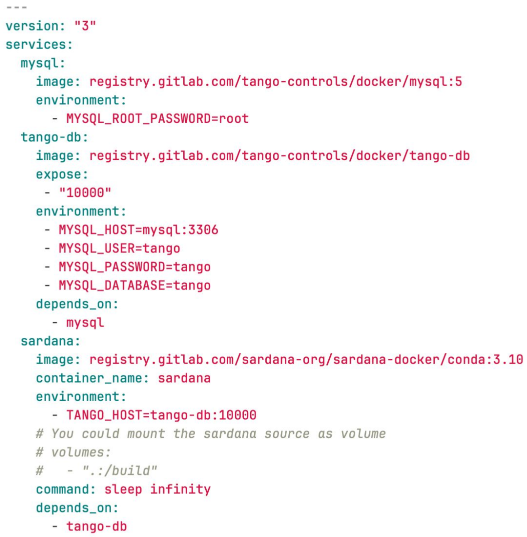
New **create_sar_demo** pytest fixture to start the Pool and MacroServer.

Using GitLab CI services to start mysql and tango-db



```
run-test:
  stage: test
  tags: [saas-linux-small-amd64]
  parallel:
    matrix:
      # pin conda:3.7-15 due to #1829
      - SARDANA_IMAGE: [":latest", "/conda:3.7-15", "/conda:3.8", "/conda:3.9", "/conda:3.10", "/conda:3.11"]
  image: registry.gitlab.com/sardana-org/sardana-docker${SARDANA_IMAGE}
  variables:
    GIT_STRATEGY: none
    MYSQL_HOST: "gitlab-runner-tango-mysql:3306"
    MYSQL_DATABASE: "tango"
    MYSQL_ROOT_PASSWORD: "root"
    MYSQL_USER: "tango"
    MYSQL_PASSWORD: "tango"
    # Required for communication between services to be enabled
    FF_NETWORK_PER_BUILD: "true"
  services:
    - name: registry.gitlab.com/tango-controls/docker/mysql:5
      alias: gitlab-runner-tango-mysql
    - name: registry.gitlab.com/tango-controls/docker/tango-db
      alias: gitlab-runner-tango-db
```

Locally, one can use docker-compose.
Check the README from
https://gitlab.com/sardana-org/sardana-docker



```
---
version: "3"
services:
  mysql:
    image: registry.gitlab.com/tango-controls/docker/mysql:5
    environment:
      - MYSQL_ROOT_PASSWORD=root
  tango-db:
    image: registry.gitlab.com/tango-controls/docker/tango-db
    expose:
     - "10000"
    environment:
     - MYSQL_HOST=mysql:3306
     - MYSQL_USER=tango
     - MYSQL_PASSWORD=tango
     - MYSQL_DATABASE=tango
    depends_on:
      - mysql
  sardana:
    image: registry.gitlab.com/sardana-org/sardana-docker/conda:3.10
    container_name: sardana
    environment:
      - TANGO_HOST=tango-db:10000
    # You could mount the sardana source as volume
    # volumes:
    #   - ".:/build"
    command: sleep infinity
    depends_on:
      - tango-db
```

Project maintenance

Maintenance and housekeeping

Periodic releases (~ twice per year):

- not followed by all institutes but setting a point for summarising updates/news
- manual tests in all relevant platforms, helping to discover “hidden” bugs and checking compatibilities with systems and other software packages

Keep compatibility with updates/developments of extern software packages:

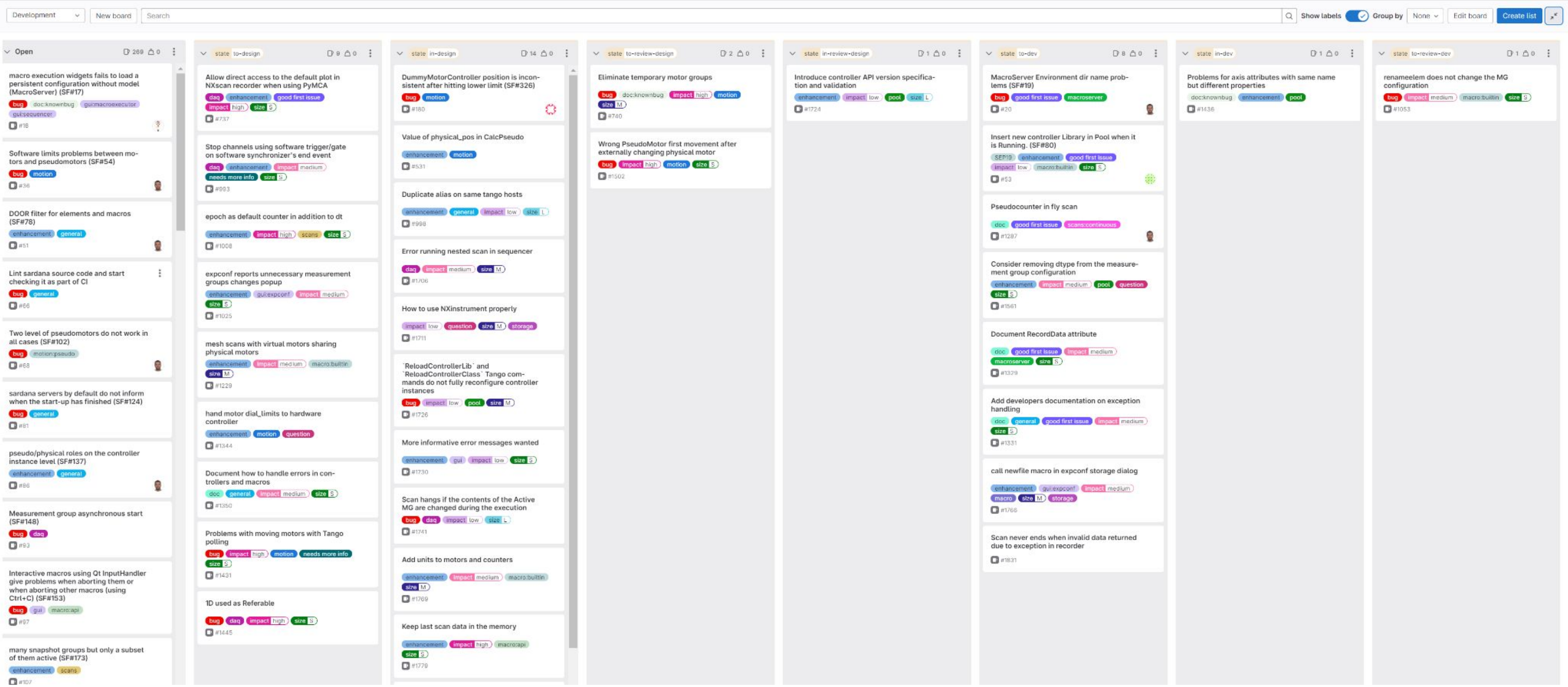
- important amount of work is dedicated to keep the compatibility with external packages
- issues with new versions of Python and PyQt played an important role in the past, up to now they are fixed

Backlog:

- keep track of all issues
- classify and label issues according to urgency/amount of work/impact, …

Kanban board

- review and label issues to put in backlog
- prioritise and keep track of issues/bugs to work on
- updates/reviewed in periodic meetings
- prepared *to-dev* stage makes it easier for volunteers



Open 269 0

macro execution widgets fails to load a persistent configuration without model (MacroServer) (SF#17)
bug doc:knownbug gui:macroexecutor gui:sequencer
#18

Software limits problems between motors and pseudomotors (SF#54)
bug motion
#36

DOOR filter for elements and macros (SF#78)
enhancement general
#51

Lint sardana source code and start checking it as part of CI
bug general
#66

Two level of pseudomotors do not work in all cases (SF#102)
bug motion:pseudo
#68

sardana servers by default do not inform when the start-up has finished (SF#124)
bug general
#81

pseudo/physical roles on the controller instance level (SF#137)
enhancement general
#86

Measurement group asynchronous start (SF#148)
bug daq
#93

Interactive macros using Qt InputHandler give problems when aborting them or when aborting other macros (using Ctrl+C) (SF#153)
bug gui macro:api
#97

many snapshot groups but only a subset of them active (SF#173)
enhancement scans
#107

state to-design 9 0

Allow direct access to the default plot in NXscan recorder when using PyMCA
daq enhancement good first issue impact high size S
#737

Stop channels using software trigger/gate on software synchronizer's end event
daq enhancement impact medium needs more info size S
#993

epoch as default counter in addition to dt
enhancement impact high scans size S
#1008

expconf reports unnecessary measurement groups changes popup
enhancement gui:expconf impact medium size S
#1025

mesh scans with virtual motors sharing physical motors
enhancement impact medium macro:builtin size M
#1229

hand motor dial_limits to hardware controller
enhancement motion question
#1344

Document how to handle errors in controllers and macros
doc general impact medium size S
#1350

Problems with moving motors with Tango polling
bug impact high motion needs more info size S
#1431

1D used as Referable
bug daq impact high size S
#1445

state in-design 14 0

DummyMotorController position is inconsistent after hitting lower limit (SF#326)
bug motion
#180

Value of physical_pos in CalcPseudo
enhancement motion
#531

Duplicate alias on same tango hosts
enhancement general impact low size L
#998

Error running nested scan in sequencer
daq impact medium size M
#1706

How to use NXinstrument properly
impact low question size M storage
#1711

`ReloadControllerLib` and `ReloadControllerClass` Tango commands do not fully reconfigure controller instances
bug impact low pool size M
#1726

More informative error messages wanted
enhancement gui impact low size S
#1730

Scan hangs if the contents of the Active MG are changed during the execution
bug daq impact low size L
#1741

Add units to motors and counters
enhancement impact medium macro:builtin size M
#1769

Keep last scan data in the memory
enhancement impact high macro:api size S
#1779

state to-review-design 2 0

Eliminate temporary motor groups
bug doc:knownbug impact high motion size M
#740

Wrong PseudoMotor first movement after externally changing physical motor
bug impact high motion size S
#1502

state in-review-design 1 0

Introduce controller API version specification and validation
enhancement impact low pool size L
#1724

state to-dev 8 0

MacroServer Environment dir name problems (SF#19)
bug good first issue macroserver
#20

Insert new controller Library in Pool when it is Running. (SF#80)
SEP19 enhancement good first issue impact low macro:builtin size S
#53

Pseudocounter in fly scan
doc good first issue scans:continuous
#1287

Consider removing dtype from the measurement group configuration
enhancement impact medium pool question size S
#1561

Document RecordData attribute
doc good first issue impact medium macroserver size S
#1329

Add developers documentation on exception handling
doc general good first issue impact medium size S
#1331

call newfile macro in expconf storage dialog
enhancement gui:expconf impact medium macro size M storage
#1768

Scan never ends when invalid data returned due to exception in recorder
#1831

state in-dev 1 0

Problems for axis attributes with same name but different properties
doc:knownbug enhancement pool
#1436

state to-review-dev 1 0

renameelem does not change the MG configuration
bug impact medium macro:builtin size S
#1053