Slow Control Software

AGATA Week 2026

Summary

- Interface with Topology manager and respective roles
- Slow Control :
  - New crystal colors on the main page and legend
  - Cards IPus connection and IDs checking
  - Card information page
  - Actions (STARE and PACE python functions)
    - Arguments page customized for each one
    - Automatic interpretation from documentation
    - Automated tests
- Repositories (github, gitlab, FW, SW) and software name

Interface with TopologyManager

- TM information about available STARE cards

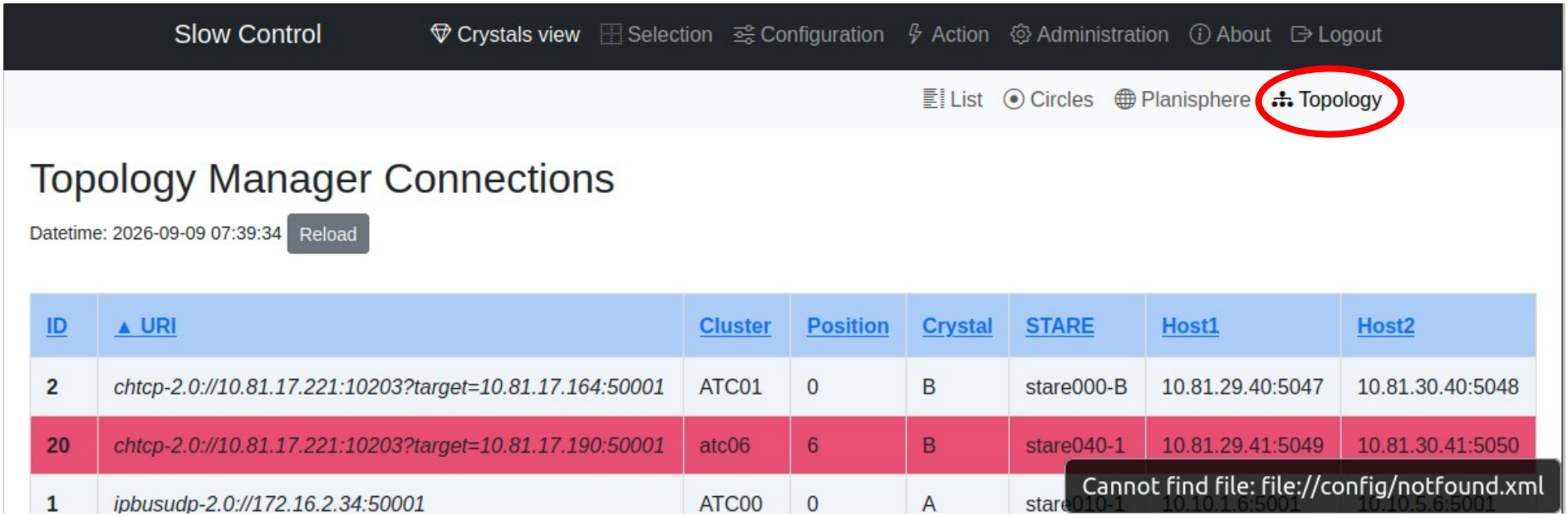

```
{"connections":[
    {
        "id":"stare.0",
        "uri":"chtcp-2.0://10.81.17.221:10203?target=10.81.17.157:50001",
        "address_table":"file:///… /Stare_Utility/STARE.xml",
        "cluster":"ATC01", "position":11, "crystal":"A",
        "host1": "10.10.1.6", "port1": 5001, "host2": "10.10.5.6", "port2": 5001,
        "data_from":      "FROMSTARE",
        "stare":"stare06-A",
        "stare_bitstream_id":"DEADC0DE", "pace_bitstream_id":"FADEF00D"
    },
    ...
```


controlhub IP

card IP

- TM takes care of the network configuration and data flows
- SC configures and drives the cards, Oscilloscope shows inspection signals

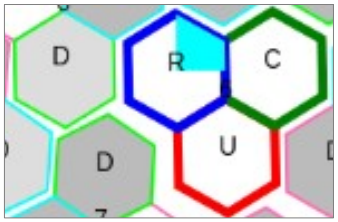
Topology Manager Connections



- Coherence tests, errors signaled by background color and tooltip
  - Unicity of : names, tuple [Position, Crystal]
  - missing fields
  - Existence of the IPbus address file
- Detection of new available topology
- JSON file download for visualization or error detection

Cards colors and legend

- Crystal background colors : Out, In, Down, Failed
- Crystal border widths : selection
- Partial filling : trigger rate of detector
- Letter : status of Finite State Machine (D, U, C, I, R)



Cards checking

- Test IPbus connection
- Check that firmware ID bitstreams match with TM
  - STARE
  - PACE

Cards information page

ⓘ Card Information

stare040-1 (Position: 19)

Name	stare040-1
Position	19
Address	chtcp-2.0://10.81.17.221:10203?target=10.81.17.190:50001
Table	file://config/STARE.xml
Host1	10.81.29.41
Port1	5049
Host2	10.81.30.41
Port2	5050
Pace	null
Digitiser	digi000
STARE Bitstream ID	A1B4F59D
Pace Bitstream ID	12345678
Data From	FROMSTARE

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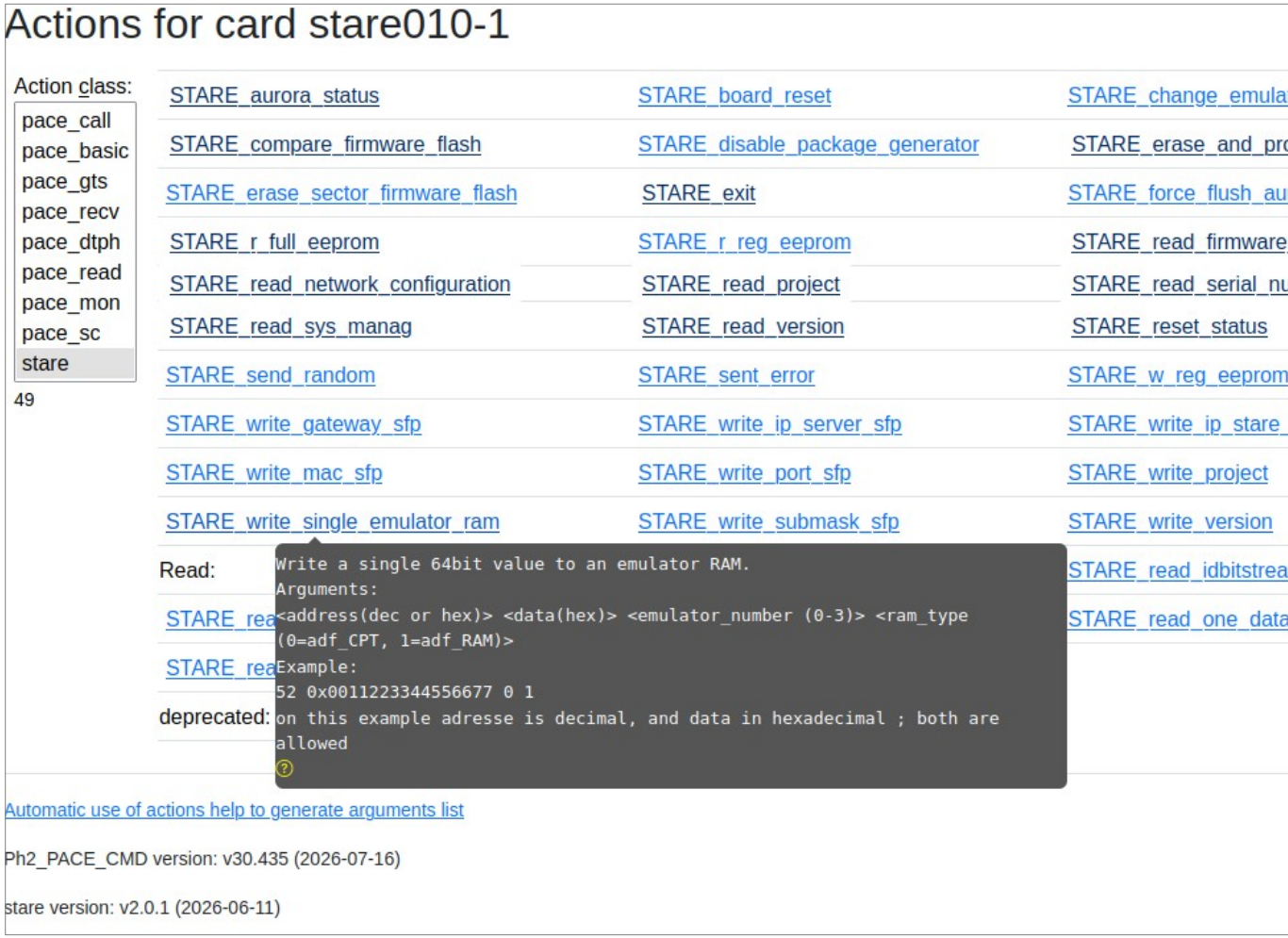
Actions documentation

- Show undocumented actions (objective : 0)
- Category inside class
- Versions of embedded python scripts
  - PACE functions
  - STARE functions
- Use of help content to generate HTML form



Automatic help content interpretation

- Page explaining how help content is automatically used to generate arguments list (rules decided after the usage):

Use of actions help to generate arguments list

Usage: or **Arguments:** followed by the description of arguments on the same or next line:

Argument list enclosed in angle brackets `< >` for required arguments or square brackets `[ ]` for optional arguments, separated by spaces. Angle brackets are not required if no type is provided. Arguments can also span over multiple lines.

A description of each argument can be placed after the first `-` or `:` character.

Within parentheses:

- A type may be provided (*int*, *dec*, *hex*, *str*, ...).
- If multiple types are possible, they are separated by `or`, e.g., `(dec or hex)`. Ranges are indicated by a `-`, e.g., `0-255`.
- Type hierarchy: *string* includes *hexadecimal*, which includes *int*, which includes intervalles (0-100)
- *file* type allows the user to upload a file
- A list of possible choices separated by commas, described after an `=` sign. Example: `(1 = enable, 0 = disable)`.
- *IP* and *MAC* types are used to mark arguments containing IP or MAC addresses

Example: will also be used to automatically test python functions

The keyword_**ignore_test**_ can be used to mark functions to be excluded from automatic tests

Interpretation rules

- <required> or [optional] arguments
- Description of arguments after ‘:’ or ‘-’
- Optional types
  - (int, dec, str, …)
- Intervales (ex. : 0-255)
- Multiple choices (ex.: 1=enable, 0=disable)
- Types hierarchy: intervales ⊂ integer ⊂ hexa ⊂ string
- Several types provided (ex. : string **or** hexa)
- Addresses IP, MAC
- Files to be uploaded by the browser
- Provided examples used for automatic tests

Arguments edit zones

- Argument types examples :
  - Intervales, integers
  - Strings
  - Multiple choices
  - Files
- Functions without arguments:
  - Direct launch or
  - User confirmation

Action STARE_generator_initialize_and_enable_v4

Argument	Description	Default	Value	Type
flow*		-	flow	Mb/s
package_size*		-	package_size	bytes
channel*		-	-- Select --	str
adf_format*		-	-- Select --	str

Cancel Launch

```
Initializes and enables STARE data generators on SFP modules (0, 1, 2, 3, all).
Usage:
<flow (Mb/s)> <package_size(bytes)> <channel (0,1,2,3,all)> <adf_format (0 =
byteANDpackage_counter, 1 = adf_CPT, 2 = adf_RAM, 3 = adf_DTH)>
Example:
2000 8192 3 2
```

Action STARE_change_emulator_ram

Argument	Description	Default	Value	Type
filename*		-	Browse... No file selected.	file
emulator_number*		-	0	int [0-3]
ram_type*		-	1	int [0-1]

Cancel Launch

```
Load emulator RAM content from a file.
Arguments:
<filename (file)> <emulator_number (0-3)> <ram_type (0-1)>
```

Automated tests

- PACE and STARE functions represent 20,000 code lines
- Automatic tests procedure:
  - Test empty Database creation
  - Actions launched (examples, min, max values)
    - Approximately 200 automated tests
  - Fake arguments of type file generated
  - Use of an IPbus dummy machine device
- Actions can be marked to be ignored by tests (only 2)

Source code coverage

Modules	statements	missing	excluded	coverage
slowControl/pace/lib/__init__.py	0	0	0	100%
slowControl/pace/lib/aEth.py	812	444	0	45%
slowControl/pace/lib/agg.py	369	306	0	17%
slowControl/pace/lib/clock.py	1679	1563	0	7%
slowControl/pace/lib/constants.py	19	2	0	89%
slowControl/pace/lib/digi.py	1384	1054	0	24%
slowControl/pace/lib/sensors.py	906	726	0	20%
slowControl/pace/paceIPbus.py	246	163	0	34%
slowControl/Ph2_PACE_CMD.py	110	47	0	57%
slowControl/lib/pace_basic.py	854	606	0	29%
slowControl/lib/pace_call.py	305	147	0	52%
slowControl/lib/pace_dtph.py	993	309	0	69%
slowControl/lib/pace_gts.py	523	209	0	60%
slowControl/lib/pace_mon.py	1591	1372	0	14%
slowControl/lib/pace_read.py	1305	827	0	37%
slowControl/lib/pace_recv.py	1640	1378	0	16%
slowControl/lib/pace_sc.py	801	390	0	51%
slowControl/lib/stare.py	1123	362	0	68%

- Once the tests finished, results can be seen at: /coverage/index.html

Source code coverage

- Reasons for uncovered lines:
  - Undocumented or not well documented functions

    (PACE not yet done)
  - Explicitely ignored functions (a few ones)
  - Tests for invalid argument values already done at higher level
  - Variable numbers of arguments
  - Actions depending on values read through IPbus
  - Exceptions processing
  - Old code lines or other never called functions

Console

- `./console.sh` **(on the Slow Control server)**
- `csl.launchActionCard(0, "A", "STARE_read_idbitstream", "")`
- `csl.history([n])` **prints [n lines] history of actions**
- `csl.getParamValue(0, "A", "sys_manag.ID_bitstream")`
- `csl.setDefaultCard(0, "A")` **or** `csl.setDefaultCard(name)`
- `csl.setDefaultAction("STARE_10g_status 3")`
- `csl.quickLaunch([""])`
- `c=csl.getCardCmd(0, "A")` **or** `csl.getCardCmd(name)`
- **Examples**

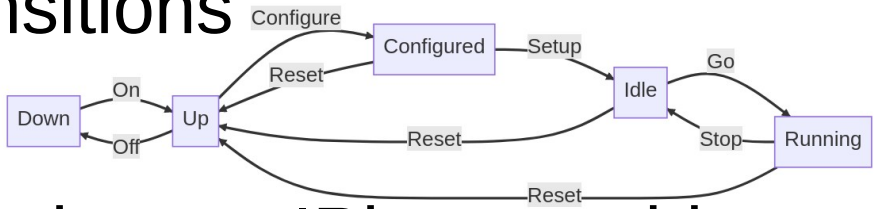
```
c.do_STARE_read_idbitstream("arguments")
c.help_PACE_init()
```

Name and Repositories

- Slow Control software name : **AgaPilot**
- ~~Github since february~~
- Firmware repository: ~~IN2P3 Gitlab agata_stare~~
- Software repository IN2P3 Gitlab agata/daq/pacecontrol
- Software repository IN2P3 Gitlab agata/daq/starecontrol
  - Contains then integrated PaceControl sources

Todo

- Test with several PACE/STARE cards simultaneously
- Increase source code coverage with automated tests
- Continue PACE/STARE functions integration work
  - Associate actions to FSM transitions



- Automated tests with non-empty dummy IPbus machines
- Update technical documentation

Thank you for your attention