

Offline Analysis Framework

OAF



Main Objective

- By Automatic Reports [AR] we mean here documents automatically generated on a regular basis from data stored in the Logging/Measurement DB.
- The basic principle would be daily Cron tasks, gathering, analysing and synthesizing Beam Instruments records in DB stored during the last 24h, and sending the corresponding summary reports automatically by mail to the corresponding experts or responsible.

Main Objective

At the current initial stage, our target is to cover as much as possible all the possible common features in **a single process simply based on data set configuration files** (as described later).

To do so we are today concentrating on 'basics', i.e. Instrument Status Assessments:

These reports will be targeted to present the 'current' **status** of an instrument family (ie each device of a given family). They should also identify and state clearly any status requiring immediate action and send an alarm (mail) when something looks wrong.

Further step looks possible. We hope to be able to cover properly and commonly instrument aging and calibration. Some examples will also be covered in here.

For the last step, i.e. instrument performance assessment, things become immediately too complicated and specific to justify standardisation effort. We will let this stage to the instrument team by providing them with a way to plug in their code in the framework, already relying on our data extraction, reporting and emailing code. (this door is not yet operational)

Disclaimer

- This tool will only look at what happened...
- It can only help us to:
 - Be aware that something went wrong in our instrument:
 - No usage
 - Bad usage
 - Over usage
 - Breakage...
 - Be aware that something is aging:
 - Calibration evolution
 - Status evolution...
- It will still be up to us to be proactive with this

Anaconda & JPyPy:

- 125+ of the most popular Python packages for science, math, engineering, data analysis (NumPy, SciPy, Pandas, IPython, Matplotlib, Numba, Blaze, Bokeh..)
- Completely free - including for commercial use
- Cross platform on Linux, Windows, Mac
- Installs into a single directory and doesn't affect other Python installations on your system. Doesn't require root or local administrator privileges
- Spyder, Ipython
- We use Jpypy for java – python integration
- Installed on bdidev2



Panda & Spyder

The image shows the Spyder Python IDE interface. The top window title is "Spyder (Python 2.7) (on cs-ccr-abb14.cern.ch)". The main editor displays a Python script with the following code:

```
1 # -*- coding: utf-8 -*-
2 """
3 Created on Mon Mar 23 11:01:00 2015
4
5 @author: bkolad
6 """
7 from numpy import random
8 import pandas as pd
9
10 ts = pd.Series(random.randn(1000), index=pd.date_range('1/1/2000', periods=1000))
11
12 ts = ts.cumsum()
13
14 ts.plot() #import matplotlib.pyplot as plt
15
16 print "hello"
17
18 from jpye import *
19 startJVM(getDefaultJVMPath(), "-ea", "-Djava.class.path=tmp/Jpye/sample")
20 java.lang.System.out.println("Hello World!!")
21 shutdownJVM()
22
```

The file explorer below the editor shows a directory structure:

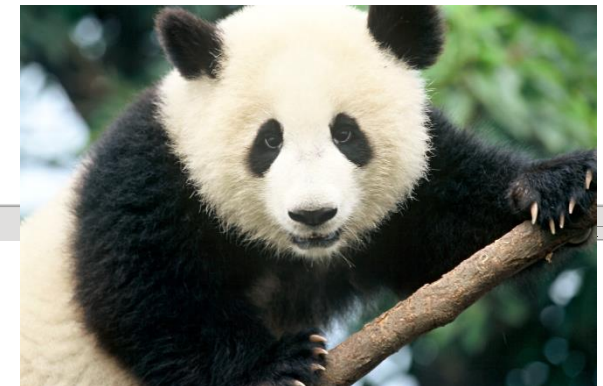
Name	Size	Type	Date Modified
anaconda		Folder	4 Feb 2015 11:43:01
basd.py	230 bytes	py File	20 Mar 2015 10:06:55
file.csv	584 bytes	csv File	23 Mar 2015 15:51:46

The IPython console shows the output of the script:

```
In [2]: runfile('/nfs/cs-ccr-nfsdev/vol1/u1/bkolad/PythonWorkspace/PandaExamples/Panda0.py', wdir='/nfs/cs-ccr-nfsdev/vol1/u1/bkolad/PythonWorkspace/PandaExamples')
hello
```

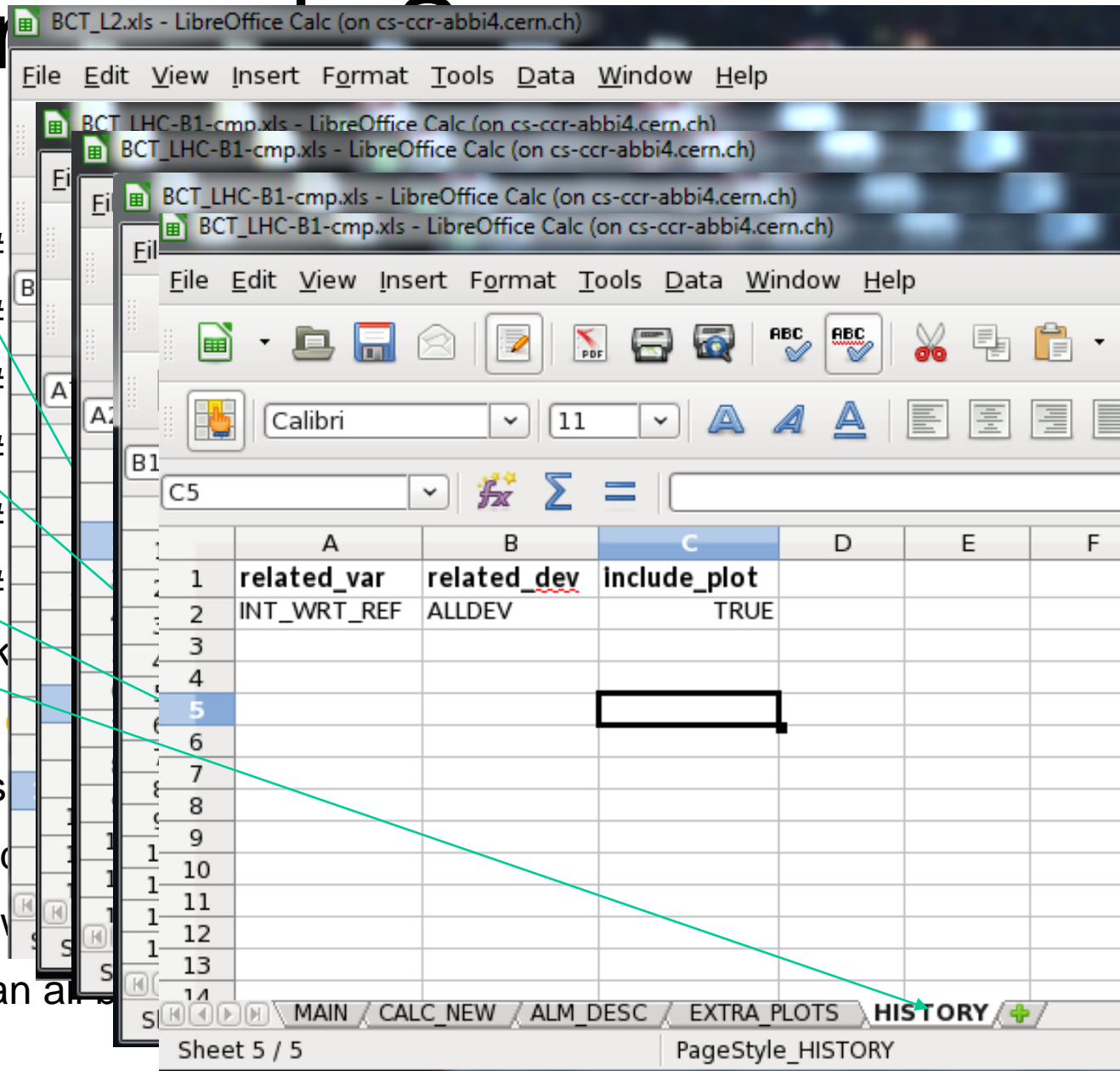
A line plot is displayed in the console, showing a time series of random noise with a cumulative sum. The x-axis is labeled with months (Jan, Jul) for the years 2000, 2001, and 2002. The y-axis ranges from -35 to 5.

At the bottom of the console, there are tabs for "Console", "IPython console", and "History log". The system tray at the bottom right shows "Memory: 55 %".



Main Framework

1. `extract_data()` # Get
2. `compute_extra_data()` #
3. `make_front_figure()` #
4. `analyse_alarms()` #
5. `display_alarms()` #
6. `make_dft_plots()` #
7. `make_ext_plots()` #
8. `make_histo()` # mak
9. `run_exp_code()` # run
10. `close_report()` # clos
11. `inform()` # send
12. `show_plots()` # show
13. `clean_all()` # clean all



- **Green:** Based on config file <inst>_<dataset>
- **Orange:** Under internal discussion. Not operational yet

Timber-Snapshots

TIMBER v6.0.12

jjgras Data Source Preferences: MDB_PRO Time Zone: LOCAL_TIME Correction RAW

Query Output Query Fill Search Fundamental Browser Acquired Parameters Variable Hierarchies Variable Search Variable Lists Snapshots Settings Help

Snapshot Selection

Public User

Snapshots Filters

Name: %
Description: %
Owner: jjgras

Search Results

Name	Owner
BI_BLM_LHC-temp	jjgras
BI_BLM_LHCSEM	jjgras
BI_BLM_temp-aux	jjgras
BI_BOFSU_LHC-status	jjgras
BI_BOFSU_LHC-tune	jjgras
BI_BPM_LHC-temp	jjgras
BI_BPM_LHC1	jjgras
BI_BPM_LHC2	jjgras
BI_BSRT_B2	jjgras
BI_BWS_LHC-B1	jjgras
BI_BWS_LHC-B2	jjgras
BI_BWS_LHC-H-inj	jjgras
BI_BWS_LHC-H-status	jjgras
BI_BWS_LHC-H-test	jjgras
BI_BWS_LHC-H-test2	jjgras
BI_BWS_LHC-H-test3	jjgras
BI_BWS_LHC-H-test4	jjgras
BI_BWS_LHC-H-test5	jjgras
BI_BWS_LHC-H-top	jjgras
BI_BWS_LHC-V-status	jjgras
BI_BWS_LHC-inj-jitter	jjgras
BI_BWS_LHC-top-jitter	jjgras
BI_BWS_LHC BWS1	jjgras
BI_BWS_PS	jjgras
BI_BWS_PS-H-status	jjgras
BI_BWS_PS-V-status	jjgras
BI_BWS_PSB-H-status	jjgras
BI_BWS_PSB-R1	jjgras
BI_BWS_PSB-R1Test	jjgras
BI_BWS_PSB-R2	jjgras
BI_BWS_PSB-R2-all	jjgras
BI_BWS_PSB-R3	jjgras
BI_BWS_PSB-R4	jjgras
BI_BWS_PSB-V-R1	jjgras

Snapshot Details

Name: BI_BCT_LHC-B1-cmp
Owner: jjgras
Visible to public:
Dynamic Time:

Dynamic Options: 1 days prior to Start of day Filter Fills Filter Beam Modes

Description: Some Snapshot Description

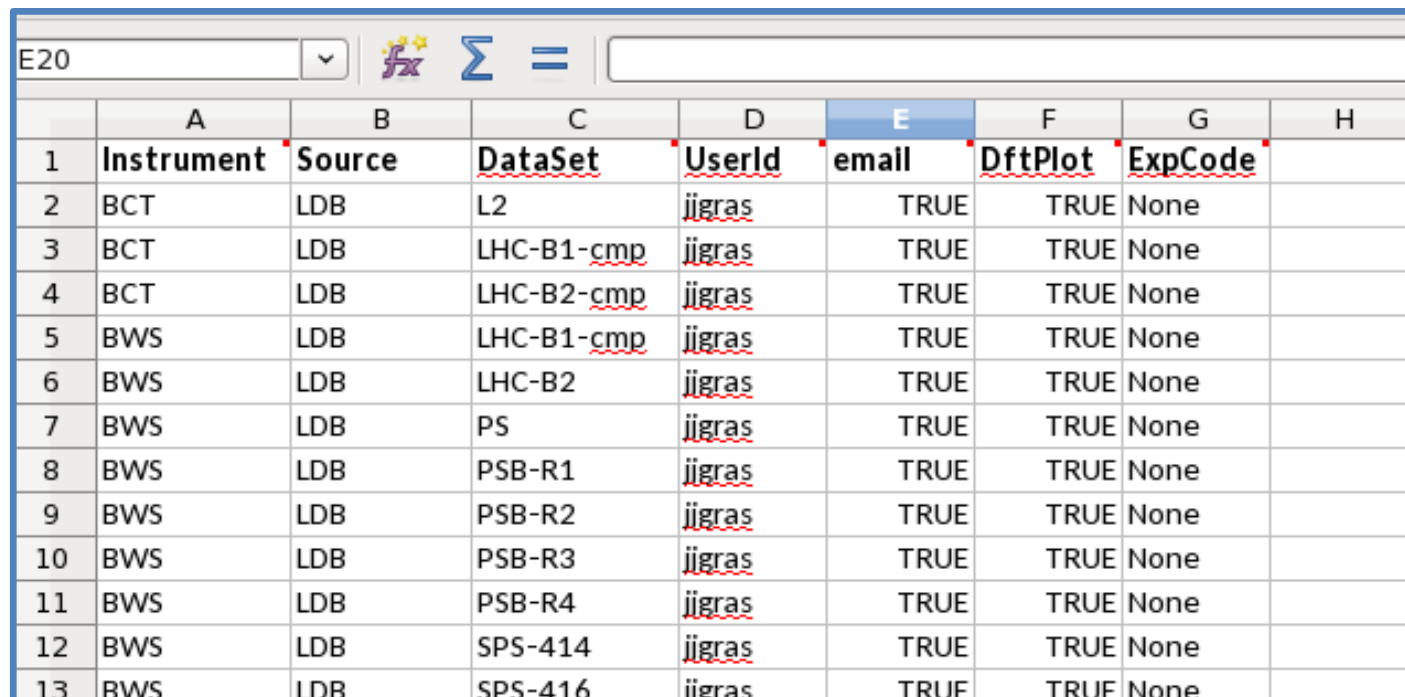
Attribute	Value
Chart Type	Versus Time
Data Source Preferences	LDB_PRO
Derivation Selection	BEST_AT_SPECIFIED_TIME
Derivation Time	2015-06-05 17:31:19.875
Dynamic Duration	1
End Time Dynamic	true
Prior Time	Start of day
Selected Variables	[HX:BMODE, LHC.BCTDC.A6R4.B1:BEAM_INTENSITY, LHC.BCTDC.A6R...
Selection Output	Chart
Time	DAYS
Time Zone	LOCAL_TIME

Load Save snapshot Delete Snapshot

10:35:13 - Start time set

Main Tools: Cron Tasks

- The tasks configured in cron task file will be executed sequentially.
- We have now cron task sequence executed every morning at 8:00. These are based on dynamic snapshot of DB data covering the full previous day
- We could have in addition cron task sequence executed every week or hours if useful...



	A	B	C	D	E	F	G	H
1	Instrument	Source	DataSet	UserId	email	DftPlot	ExpCode	
2	BCT	LDB	L2	<u>jjgras</u>	TRUE	TRUE	None	
3	BCT	LDB	<u>LHC-B1-cmp</u>	<u>jjgras</u>	TRUE	TRUE	None	
4	BCT	LDB	<u>LHC-B2-cmp</u>	<u>jjgras</u>	TRUE	TRUE	None	
5	BWS	LDB	<u>LHC-B1-cmp</u>	<u>jjgras</u>	TRUE	TRUE	None	
6	BWS	LDB	LHC-B2	<u>jjgras</u>	TRUE	TRUE	None	
7	BWS	LDB	PS	<u>jjgras</u>	TRUE	TRUE	None	
8	BWS	LDB	PSB-R1	<u>jjgras</u>	TRUE	TRUE	None	
9	BWS	LDB	PSB-R2	<u>jjgras</u>	TRUE	TRUE	None	
10	BWS	LDB	PSB-R3	<u>jjgras</u>	TRUE	TRUE	None	
11	BWS	LDB	PSB-R4	<u>jjgras</u>	TRUE	TRUE	None	
12	BWS	LDB	SPS-414	<u>jjgras</u>	TRUE	TRUE	None	
13	BWS	LDB	SPS-416	<u>jjgras</u>	TRUE	TRUE	None	

Main Tools:

Report Repository

- Mail sent will contain in addition to a summary of the alarm report:
 - A link towards the new report
 - A link towards the repository where all reports are stored (http://bewww/~bdisoft/bi_report/)
 - A link towards the repository where most recent reports are referred (http://bewww/~bdisoft/bi_report/RECENT/)
 - A link towards the repository where most recent reports with alarms are referred (http://bewww/~bdisoft/bi_report/RECENT_WITH_ALM/)
 - A link towards the repository where most recent reports without alarms are referred (http://bewww/~bdisoft/bi_report/RECENT_WITHOUT_ALM/)

Main Tools: Report Repository



The screenshot shows a Mozilla Firefox browser window with the title "Index of /~bdisoft/bi_report - Mozilla Firefox". The address bar contains "bwww/~bdisoft/bi_report/". The browser interface includes a search bar and navigation icons. Below the browser window, the text "Apache/2.2.15 (Red Hat) Server at bwww Port 80" is visible.

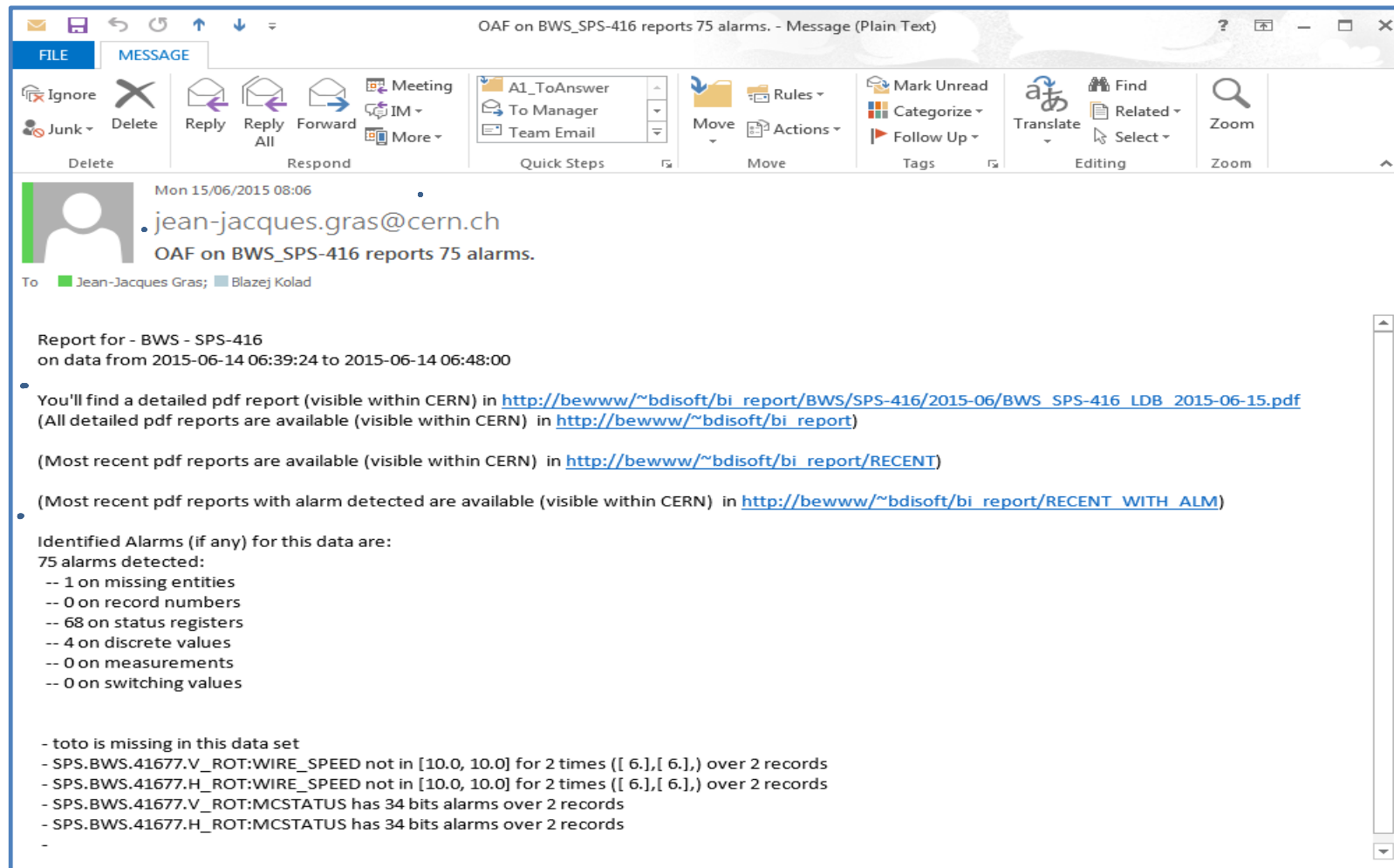
Index of /~bdisoft/bi_report

Name	Last modified	Size	Description
Parent Directory	-	-	-
BCT/	15-Jun-2015 10:39	-	-
BLW/	14-Jun-2015 08:20	-	-
BOFSU/	13-May-2015 10:21	-	-
BPM/	15-Jun-2015 21:45	-	-
BPMHISTO/	13-Jun-2015 23:07	-	-
BSRT/	08-May-2015 22:35	-	-
BWS/	14-Jun-2015 08:04	-	-
OAF/	13-May-2015 08:00	-	-
RECENT/	16-Jun-2015 08:05	-	-
RECENT_WITHOUT_ALM/	16-Jun-2015 08:05	-	-
RECENT_WITH_ALM/	16-Jun-2015 08:05	-	-

Apache/2.2.15 (Red Hat) Server at bwww Port 80

Main Tools: emailing

- Once report is done, informative email will be sent to configured recipient with link towards report and summary of alarms



OAF on BWS_SPS-416 reports 75 alarms. - Message (Plain Text)

FILE MESSAGE

Ignore Delete Reply Reply All Forward Meeting IM More

A1_ToAnswer To Manager Team Email

Move Actions

Mark Unread Categorize Follow Up

Translate Find Related Select Zoom

Mon 15/06/2015 08:06

jean-jacques.gras@cern.ch

OAF on BWS_SPS-416 reports 75 alarms.

To Jean-Jacques Gras; Blazej Kolad

Report for - BWS - SPS-416
on data from 2015-06-14 06:39:24 to 2015-06-14 06:48:00

- You'll find a detailed pdf report (visible within CERN) in http://bewww/~bdisoft/bi_report/BWS/SPS-416/2015-06/BWS_SPS-416_LDB_2015-06-15.pdf
(All detailed pdf reports are available (visible within CERN) in http://bewww/~bdisoft/bi_report)
- (Most recent pdf reports are available (visible within CERN) in http://bewww/~bdisoft/bi_report/RECENT)
- (Most recent pdf reports with alarm detected are available (visible within CERN) in http://bewww/~bdisoft/bi_report/RECENT_WITH_ALM)

Identified Alarms (if any) for this data are:
75 alarms detected:

- 1 on missing entities
- 0 on record numbers
- 68 on status registers
- 4 on discrete values
- 0 on measurements
- 0 on switching values

- toto is missing in this data set

- SPS.BWS.41677.V_ROT:WIRE_SPEED not in [10.0, 10.0] for 2 times ([6.],[6.],) over 2 records
- SPS.BWS.41677.H_ROT:WIRE_SPEED not in [10.0, 10.0] for 2 times ([6.],[6.],) over 2 records
- SPS.BWS.41677.V_ROT:MCSTATUS has 34 bits alarms over 2 records
- SPS.BWS.41677.H_ROT:MCSTATUS has 34 bits alarms over 2 records

Coming Next

- New stuff, so expect bugs, missing features... but let give it a try and chance as is to cover correctly its first purpose (status and aging) before seeking for more (absolute perf assessment). JJ is available to discuss and implement your wishes for status/aging reports for this first stage. Probably a lot of useful things can already be done there.
- Possible complains from CO/DM due to our new activity on their DB.
 - We spoke to them. They are aware on our development and methods and will tell us first if they see issues coming on their side. They already also showed that they can help us when we share some interest on the request.
- Data extraction prevented by data size
 - CO/DM recognize a problem on their side preventing extraction when it should be possible. They are working on it. Some progress done already...
 - We should understand on our side that having a lot of details in the DB will slow down or even prevent useful automatic reporting. We should have a good understanding of all the DB configuration features and go for the good compromises.

The Next Steps

- Missing and foreseen features:
 - History features for easy long term monitoring on NUMERICS and VECTORNUMERICS
 - Handling of images (especially with dynamic dimensions)
 - Low resolution reports.
 - When aging/status reports will be properly covered by a stabilized framework, open the door (via a maintainable/efficient solution) to the configurable introduction of dedicated code by <instr/dataset> developed by expert...

Potential Extra Usage

- We could try also to use this tool 'ONLINE' during MD
 - We could define a short time (ie 15 mn) dynamic DB snapshot to look at the last 15 mn DB recording to check that things are going well
 - We could define before the MD a DB snapshot covering the entire MD time frame and play this snapshot during the MD to already see in realtime the data analysis we prepared before.

Reports..

ANNEXES

Main Framework Sequence:

`make_front_figure`

Purpose:

Makes the report front pages with title, description of dataset, list of variables extracted...

Main Tools:

Naming Conventions

- In order to make things possible and a little organised, we used (and impose to work with OAF) the following naming conventions.
- Each set of data (not when, only what) will be identified by an **<instrument ID>** and a **<data set ID>**
- <dataSet ID> must not contain the ‘_’ or ‘ ’ characters
- <instrument ID. Must belong to a predefined list that the OAF team is maintaining
- The corresponding Timber ‘snapshot’ (see later)

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Anaconda packages ...

```
_license 1.1 py34_0
abstract-rendering 0.5.1 np19py34_0
anaconda 2.2.0 np19py34_0
argcomplete 0.8.4 py34_0
astropy 1.0.1 np19py34_0
bcolz 0.8.1 np19py34_0
beautiful-soup 4.3.2 py34_0
beautifulsoup4 4.3.2 <pip>
binstar 0.10.1 py34_3
bitarray 0.8.1 py34_0
blaze 0.7.3 <pip>
blaze-core 0.7.3 np19py34_0
blz 0.6.2 np19py34_0
bokeh 0.8.1 np19py34_1
boto 2.36.0 py34_0
certifi 14.05.14 py34_0
cffi 0.9.2 py34_0
clyent 0.3.4 py34_0
colorama 0.3.3 py34_0
conda 3.10.0 py34_0
conda-build 1.11.0 py34_0
conda-env 2.1.3 py34_0
configobj 5.0.6 py34_0
cryptography 0.8 py34_0
```

Anaconda packages ...

```
_license 1.1 py34_0
abstract-rendering 0.5.1 np19py34_0
anaconda 2.2.0 np19py34_0
argcomplete 0.8.4 py34_0
astropy 1.0.1 np19py34_0
bcolz 0.8.1 np19py34_0
beautiful-soup 4.3.2 py34_0
beautifulsoup4 4.3.2 <pip>
binstar 0.10.1 py34_3
bitarray 0.8.1 py34_0
blaze 0.7.3 <pip>
blaze-core 0.7.3 np19py34_0
blz 0.6.2 np19py34_0
bokeh 0.8.1 np19py34_1
boto 2.36.0 py34_0
certifi 14.05.14 py34_0
cffi 0.9.2 py34_0
clyent 0.3.4 py34_0
colorama 0.3.3 py34_0
conda 3.10.0 py34_0
conda-build 1.11.0 py34_0
conda-env 2.1.3 py34_0
configobj 5.0.6 py34_0
cryptography 0.8 py34_0
```