LARGE SYNOPTIC SURVEY TELESCOPE

LSST-France
Montpellier
7-8 avril 2015

LARGE SYNOPTIC SURVEY TELESCOPE

Les outils pour le Calcul

- Le Stack
- Les ressources de calcul
- Pilotage des jobs
- Le développement logiciel

LSST Data Productions

- The LSST Stack
  - Inputs
    - Raw Exposures
      - The output from the camera is a set of image sections from each amplifier on each sensor in the focal plane array, including overscan.
  - Reference Standard Catalogs
  - Calibration Reference Files
  - Image Templates
    - Co-added, single-band image of the sky that is deep, and where all transients, SSObjects, and artifacts have been removed.

https://confluence.lsstcorp.org/display/LSWUG/Tour+of+the+Software+Stack

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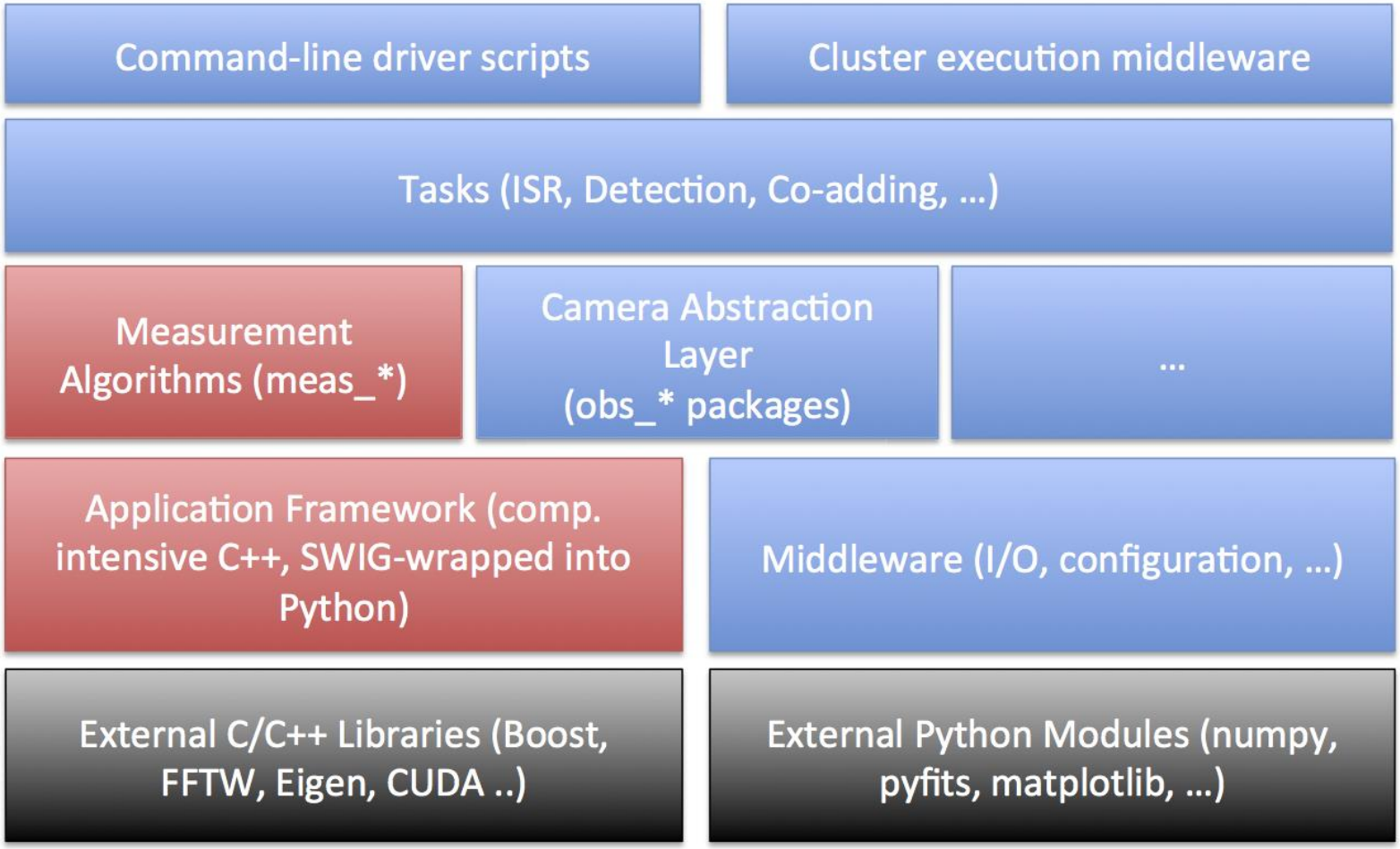
Le Stack



Red: Mostly C++ (but Python wrapped); Blue: Mostly Python; Black: External Libraries

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Nightly production

- Alert production
  - The AP operates on raw exposures obtained during a single visit, and uses the following input data (beyond that described above):
- Moving Object Processing Software (**MOPS**)
- Data Release Production (**DRP**)
  - **Single-Frame Processing**
  - **Co-Add Creation & Measurement**
  - **Multi-epoch Measurement**

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Data Products

- Deep Co-Add
  - DRP: Per-band, overlapping Visit images are warped to the survey geometry, background subtracted, and co-added, with greater emphasis on depth than on quality metrics.
- Difference
  - Difference between a Visit image and a temporally appropriate Template, warped to the same geometry, and placed on the same photometric scale.
- Multi-color
  - Similar to Deep Co-Add, but with co-addition of multiple passbands.
- Template DRP
  - Similar to Deep Co-Add, except that contributing images are selected for quality attributes such as PSF size, airmass of observation. Transients, SSObjects, and artifacts are removed.
- Visit
  - Exposures in a visit are combined into a single, calibrated image with PSF characterization and mask planes.

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Catalogs

- CoaddSource
  - Astrophysical entities
- ForcedSource
  - Single-epoch forced-photometry of CoaddSources that are not detected above the S/N threshold.
- Object
  - Astrophysical entity, formed by associating Sources at multiple epochs to a common phenomenon.
- Source
  - Single-epoch observation of an astrophysical entity, detected above the S/N threshold.
- SSObject
  - Solar system objects, formed by associating DIASources at different positions at multiple epochs to a plausible orbit of a solar system body.
- DIASource
  - Single-epoch observation of an astrophysical entity, detected above the S/N threshold on a difference image.
- DIAObject
  - Astrophysical entity, formed by associating DIASources at multiple epochs to a common phenomenon.

Le développement logiciel

- Le Stack
  - Version 10
  - Nombreuses améliorations récentes pour l'installation du Stack précompilé (cf Fabio)
  - Aussi pour la documentation
    - Outils de build (EUPS, Scons)
  - Outils pour le pilotage des jobs ?
    - *À étudier pour intégration aux outils CC*
- Trello
- Le Notebook iPython
- Git(GitHub)

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Les ressources de calcul

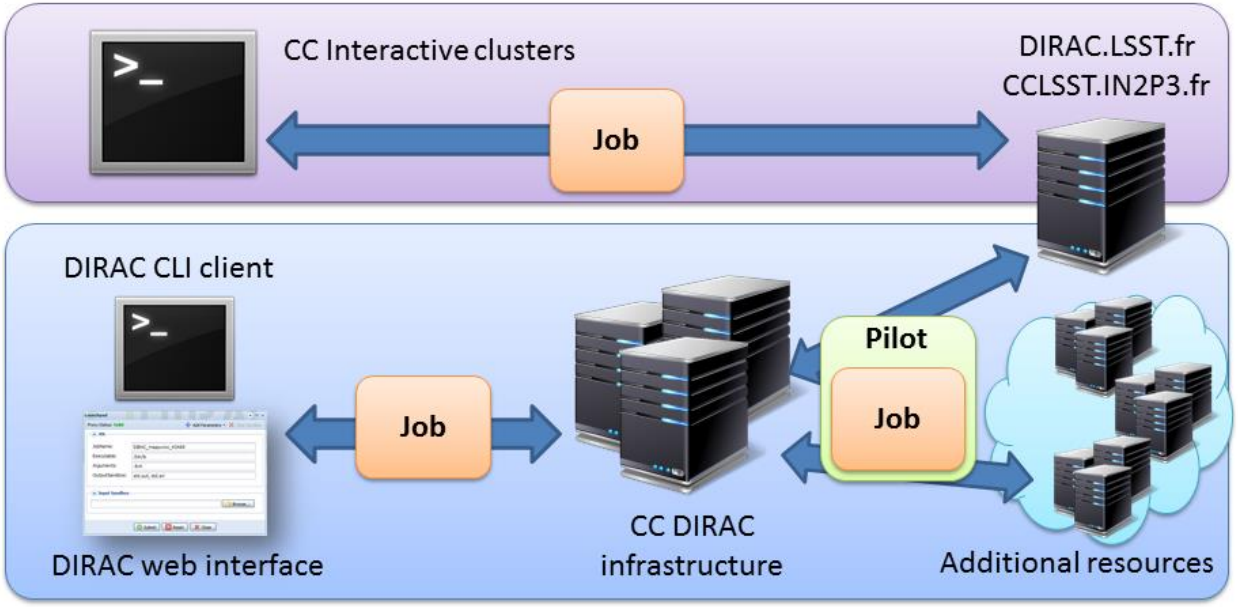
- Rappel: Le DC 2013
  - 10^5 CPU hours – 700 CPU cores in // during 2.5 months
  - Input data : 4.8 TB in 4.4 million files
  - Output data : ~100 TB in 21 million files stored in GPFS
  - Data exchanged between NCSA and CC-IN2P3 through the network
  - Output products stored in a large MySQL database
  - Test of the Dirac middleware system at CC-IN2P3
  - Database issue completely underestimated
    - Several 700 GB tables with 2 billions lines => took ages to create index

- Les demandes pour 2015
  - CPU 10^6 HS06.heures
  - SPS : 131 To
  - HPSS mass storage : 120 To
  - Mass storage: quota 200 To

- Les transferts NCSA / CC might use iRods

Pilotage des jobs

- Nous utilisons
  - GE: le système de gestion des batch standard du CC
    - http://cc.in2p3.fr/docenligne/1007
  - DIRAC:
    - Lors du DC2013
    - http://lsst.in2p3.fr/wiki/index.php/Tests_de_DIRAC_pour_LSST
    - http://diracgrid.org/files/docs/index.html



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Pilotage des jobs

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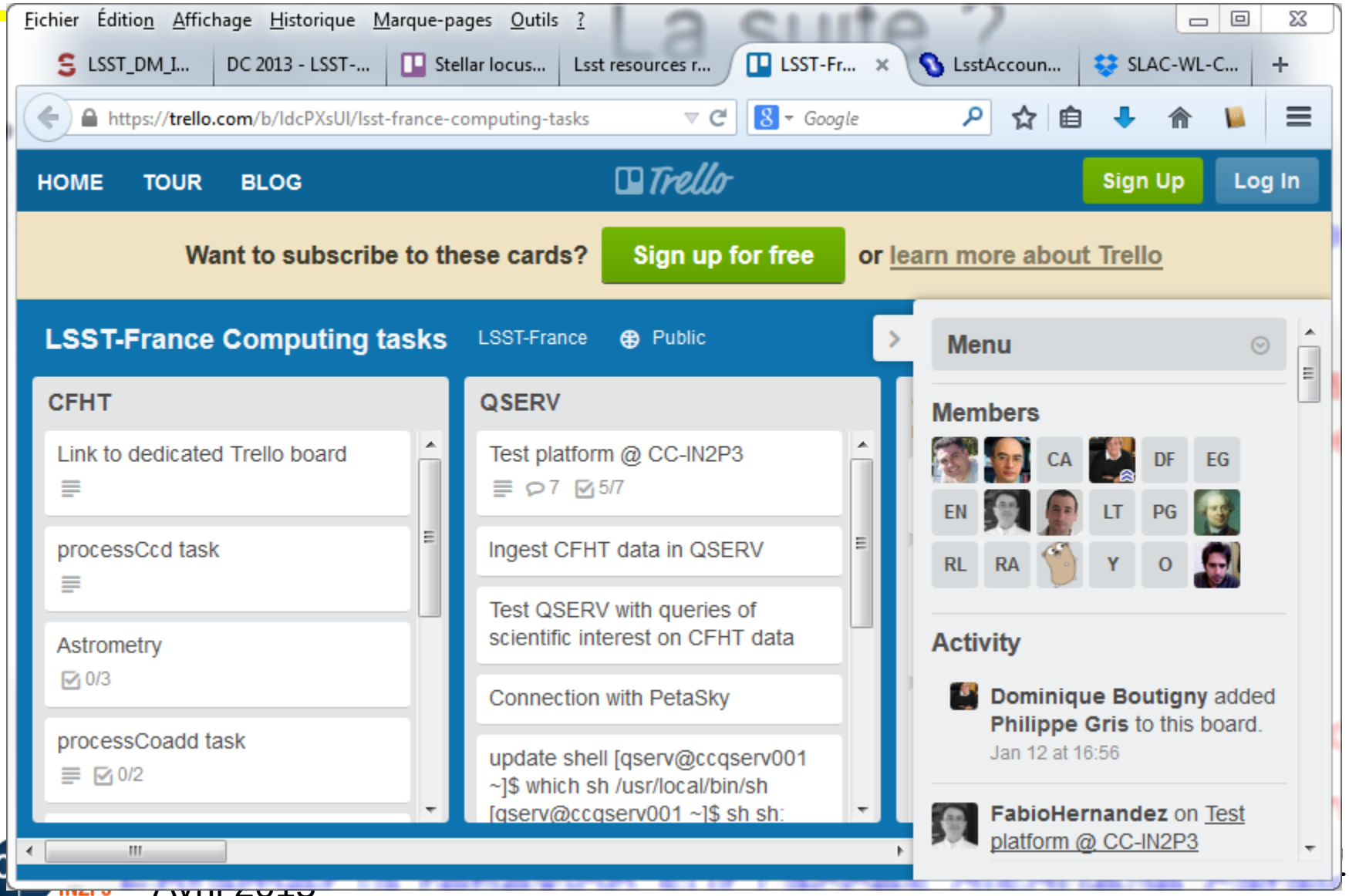
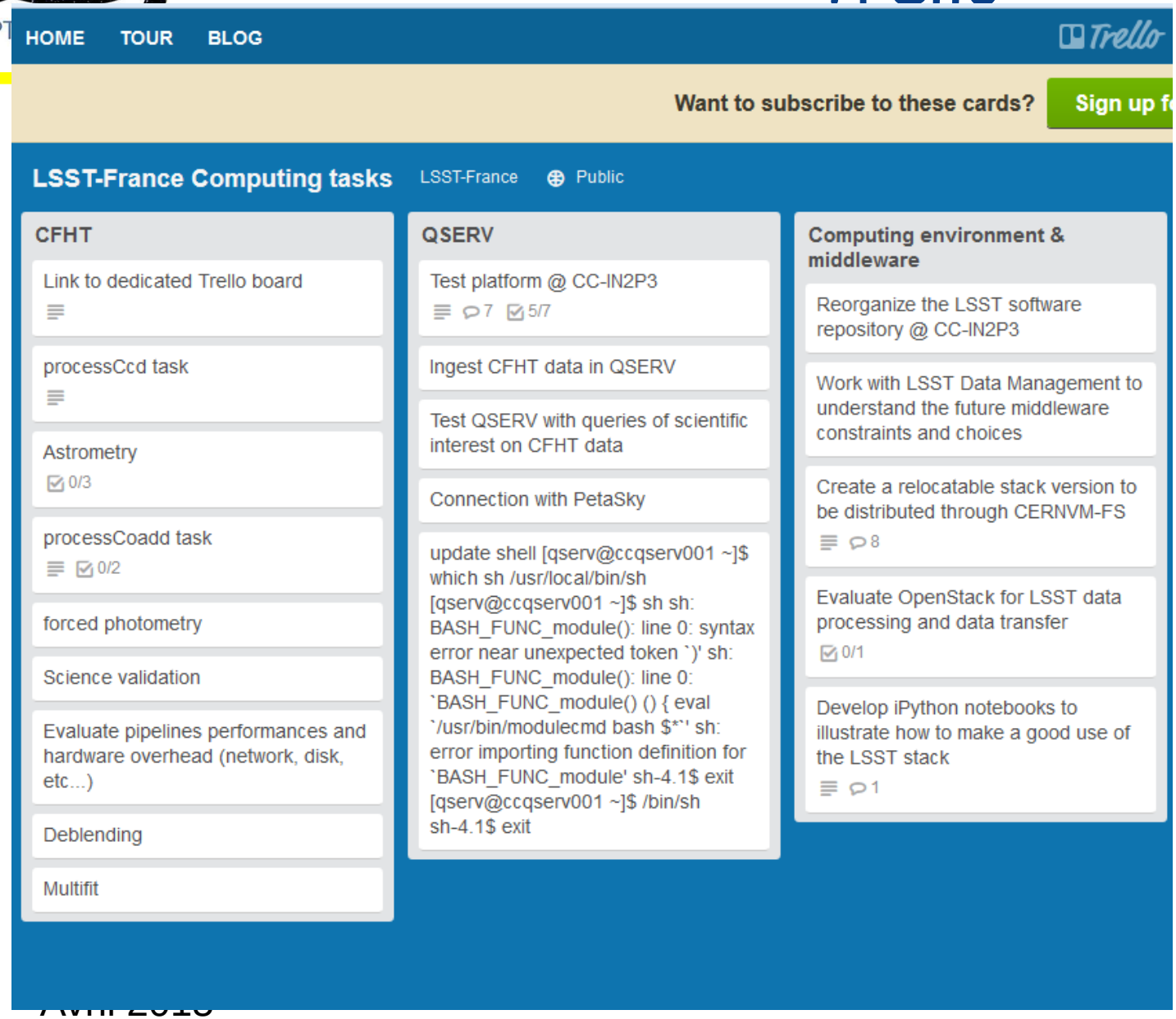
Trello



Trello


HOME
TOUR
BLOG
Trello
Want to subscribe to these cards?
Sign up f
LSST-France Computing tasks
LSST-France
Public
CFHT
Link to dedicated Trello board
processCcd task
Astrometry
0/3
processCoadd task
0/2
forced photometry
Science validation
Evaluate pipelines performances and hardware overhead (network, disk, etc...)
Deblending
Multifit
QSERV
Test platform @ CC-IN2P3
7
5/7
Ingest CFHT data in QSERV
Test QSERV with queries of scientific interest on CFHT data
Connection with PetaSky
update shell [qserv@ccqserv001 ~]$ which sh /usr/local/bin/sh [qserv@ccqserv001 ~]$ sh sh: BASH_FUNC_module(): line 0: syntax error near unexpected token `)' sh: BASH_FUNC_module(): line 0: `BASH_FUNC_module() () { eval `/usr/bin/modulecmd bash $*`' sh: error importing function definition for `BASH_FUNC_module' sh-4.1$ exit [qserv@ccqserv001 ~]$ /bin/sh sh-4.1$ exit
Computing environment & middleware
Reorganize the LSST software repository @ CC-IN2P3
Work with LSST Data Management to understand the future middleware constraints and choices
Create a relocatable stack version to be distributed through CERNVM-FS
8
Evaluate OpenStack for LSST data processing and data transfer
0/1
Develop iPython notebooks to illustrate how to make a good use of the LSST stack
1

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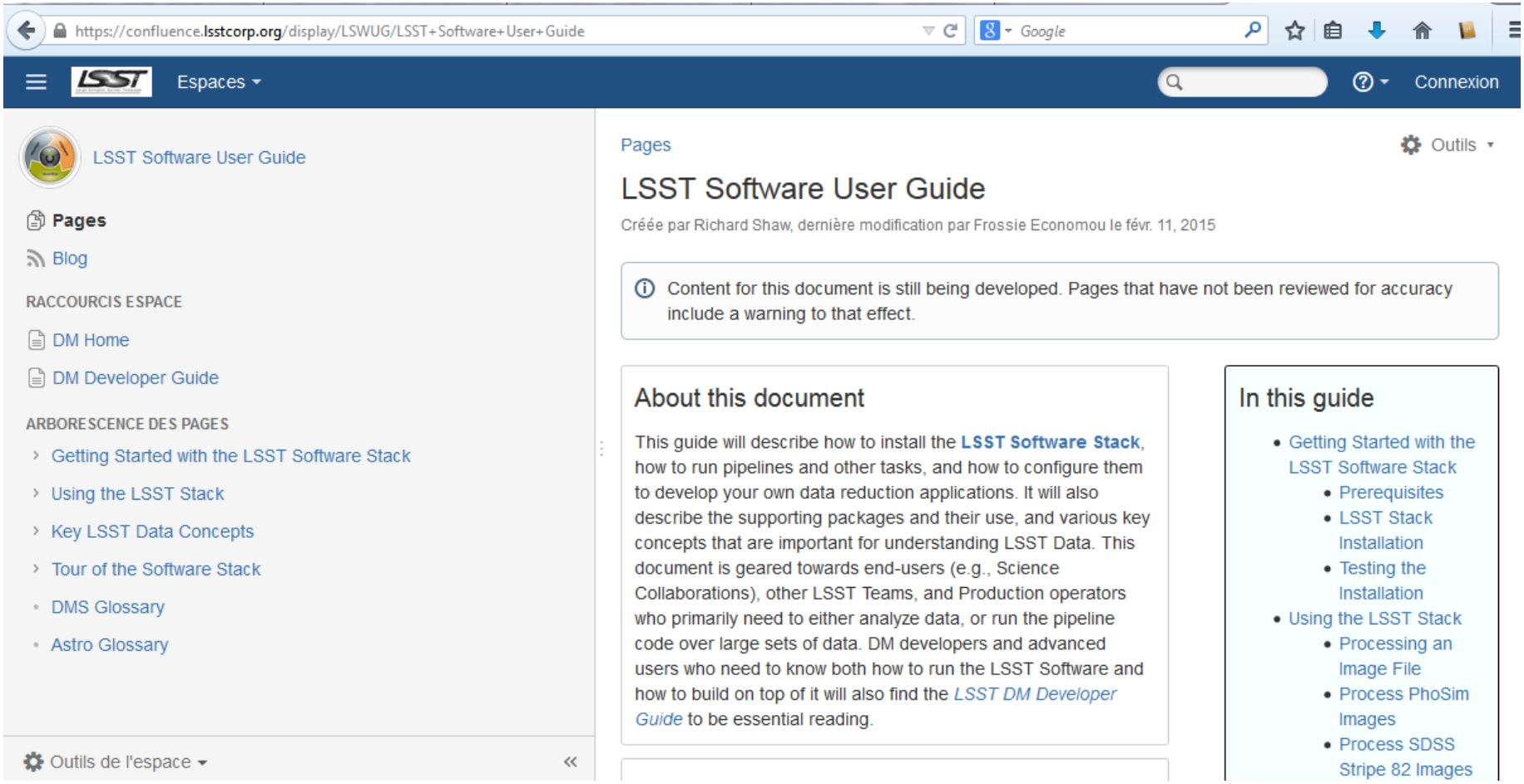
Confluence

- https://confluence.lsstcorp.org



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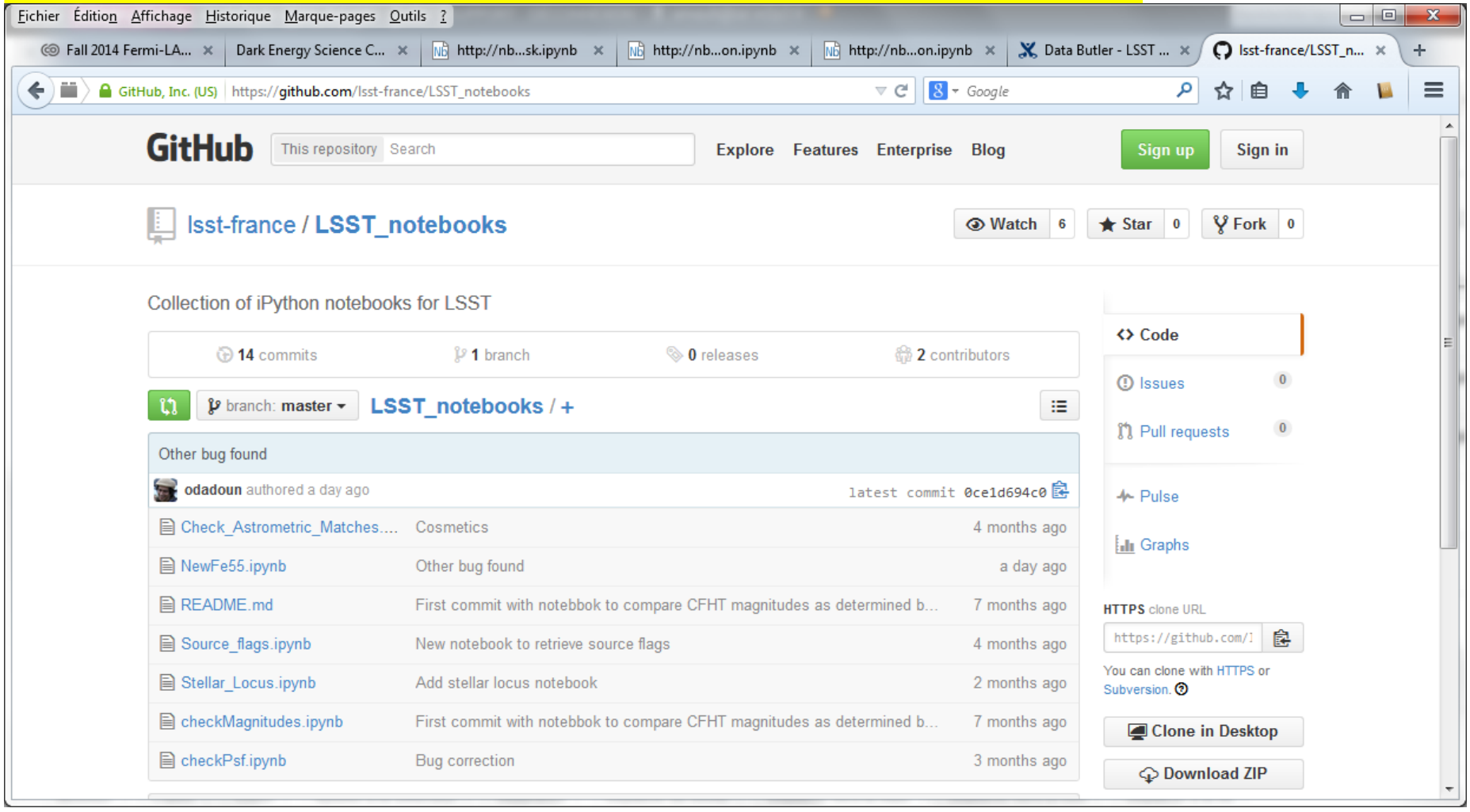
GitHub



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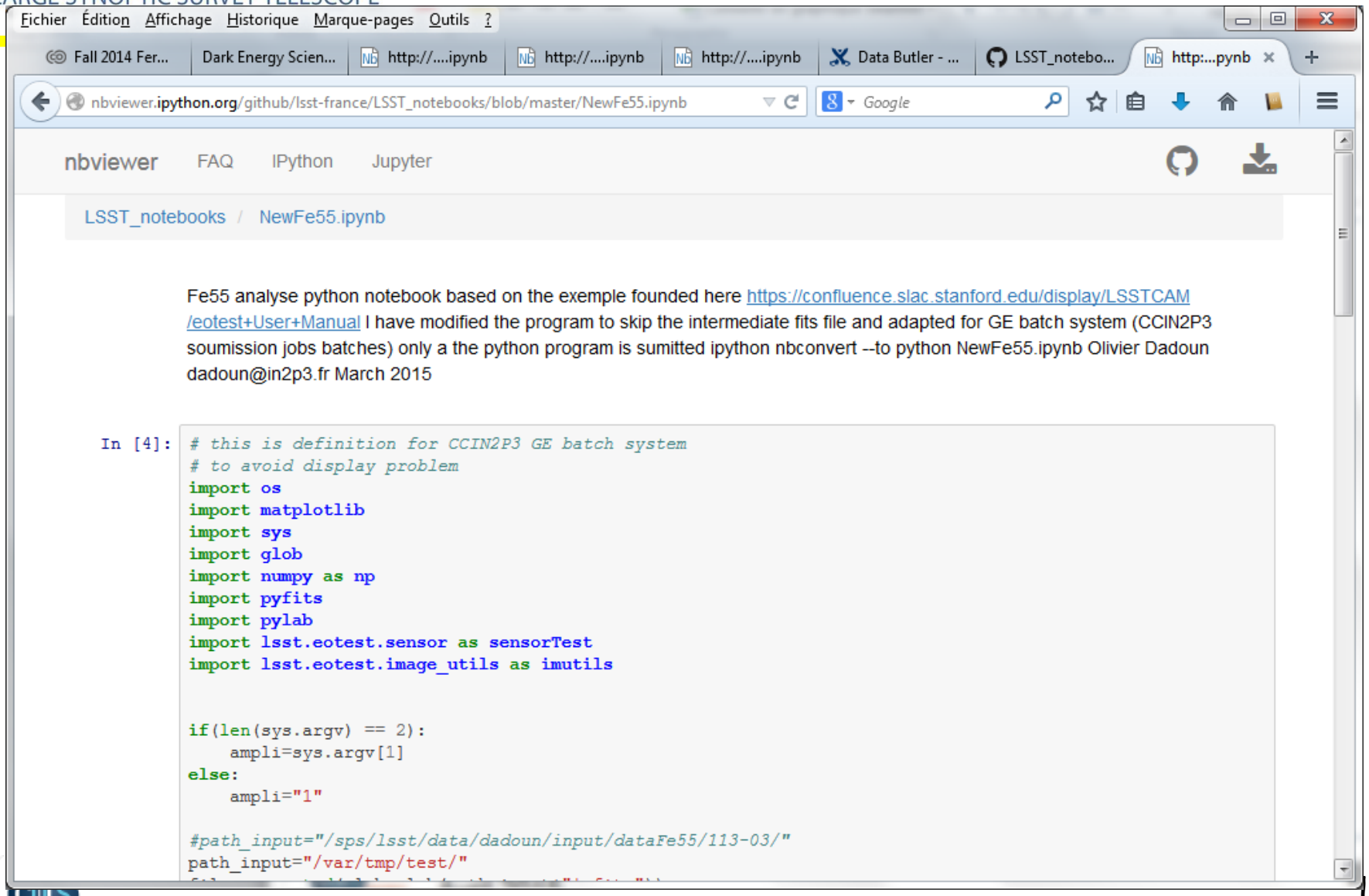
Notebook iPython



Notebook iPython

Fichier Édition Affichage Historique Marque-pages Outils ?

Fall 2014 Fer... | Dark Energy Scien... | http://....ipynb | http://....ipynb | http://....ipynb | Data Butler - ... | LSST_notebo... | http:...pynb

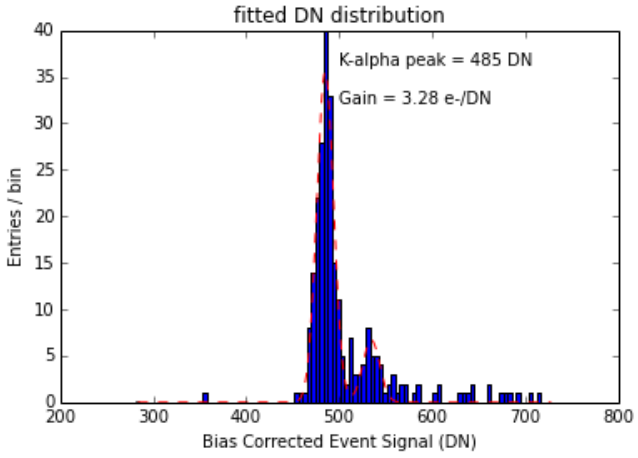
nbviewer.ipython.org/github/lsst-france/LSST_notebooks/blob/master/NewFe55.ipynb

nbviewer FAQ IPython Jupyter

```
    with open(txt, "w") as the_file:
        the_file.write("# Ampli %s -> Kalpha peak %i gain e-/DN %.2f\n" % (ampli,kalpha_peak, gain))
        for val in dn[index]:
            #sys.stdout.write("%f\n"%i)
            the_file.write("%.2f\n" % val)

# In[ ]:
```

```
processing 113-03_fe55_fe55_010_lsstsensortest.00_008_20140709223441.fits
----> Amp :  1
```



In [ ]:

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Liens

https://github.com/lsst-france/LSST_notebooks

http://nbviewer.ipython.org/github/lsst-france/LSST_notebooks/tree/master/

git clone https://github.com/lsst-france/LSST_notebooks.git