



LARGE SYNOPTIC SURVEY TELESCOPE

LSST-France Montpellier 7-8 avril 2015

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



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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

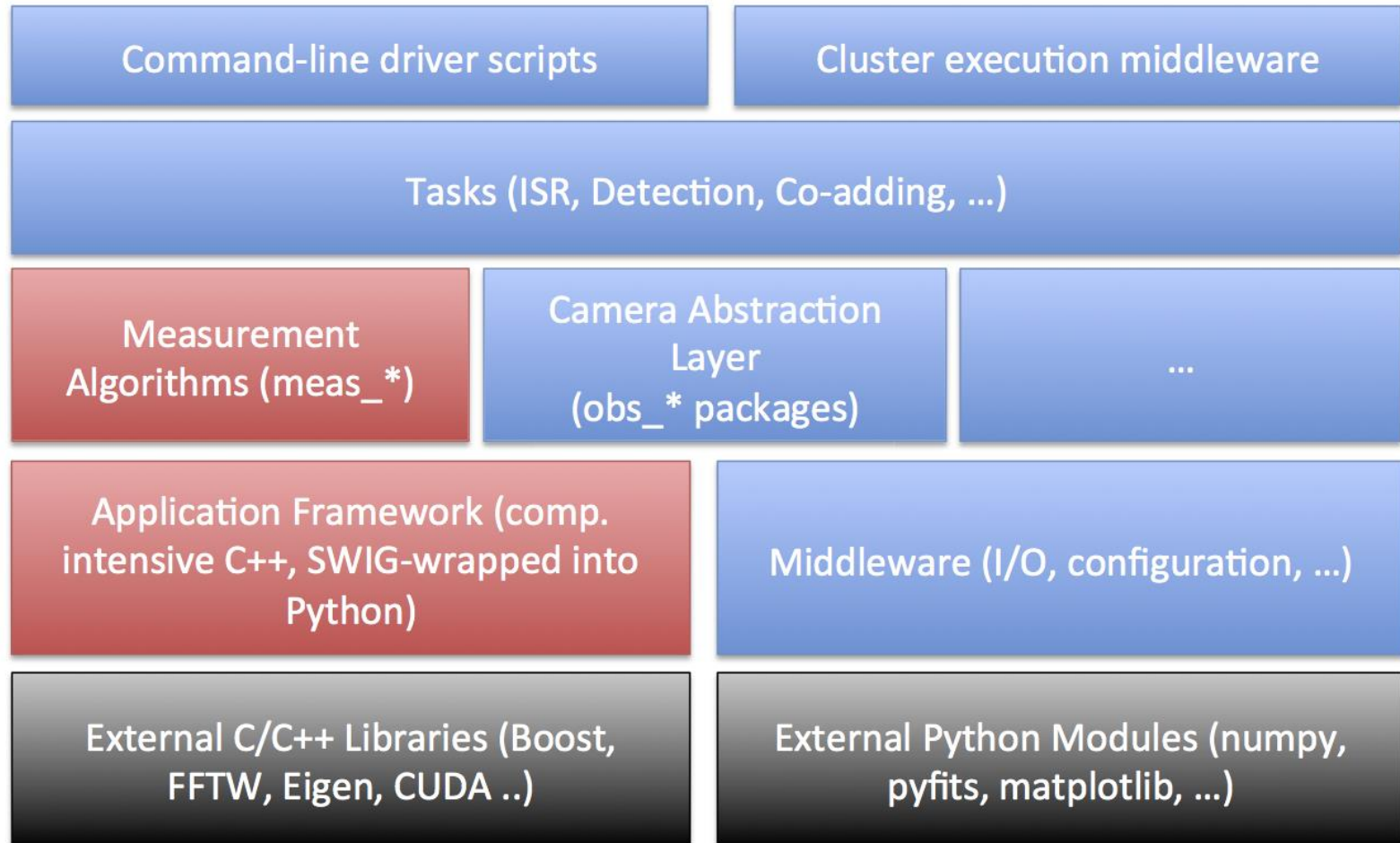
- Co-added, single-band image of the sky that is deep, and where all transients, SSO objects, and artifacts have been removed.

<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

- 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, SSO objects, 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 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**

- Nous utilisons

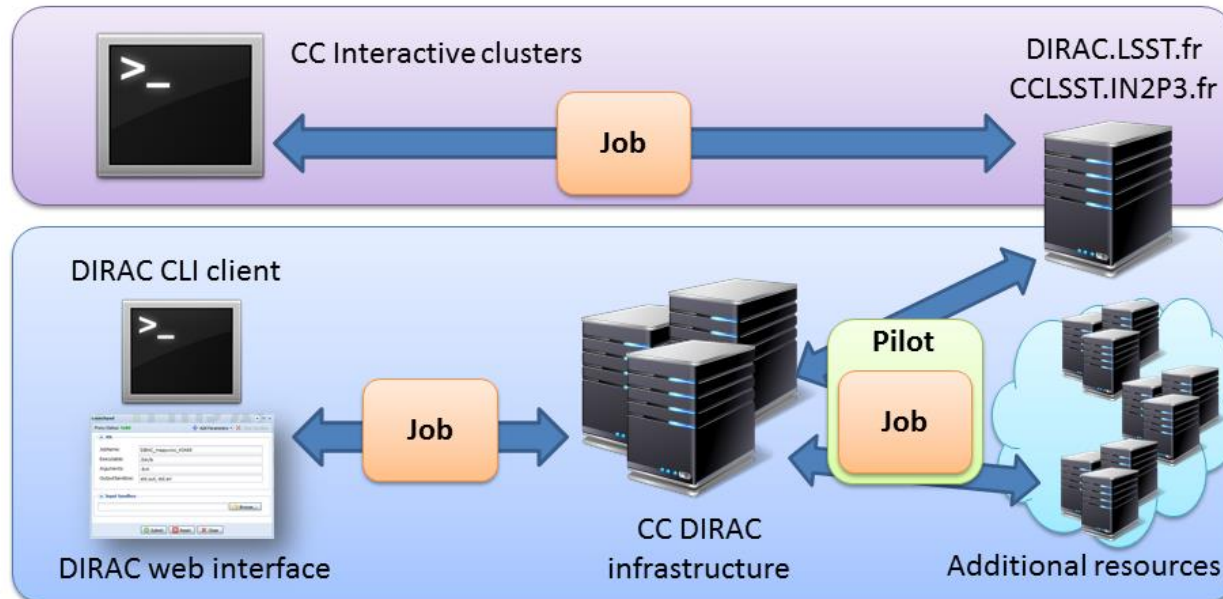
- GE: le système de gestion des batch standard du CC
 - <http://cc.in2p3.fr/docenligne/1007>

- 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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Trello

The screenshot shows a web browser window displaying a Trello board. The browser's address bar shows the URL <https://trello.com/b/ldcPXsUI/lsst-france-computing-tasks>. The Trello interface includes a navigation bar with 'HOME', 'TOUR', and 'BLOG' links, and 'Sign Up' and 'Log In' buttons. A banner below the navigation bar reads 'Want to subscribe to these cards? Sign up for free or learn more about Trello'. The main board area is titled 'LSST-France Computing tasks' and is set to 'Public'. It features two columns: 'CFHT' and 'QSERV'. The 'CFHT' column contains cards for 'Link to dedicated Trello board', 'processCcd task', 'Astrometry' (0/3), and 'processCoadd task' (0/2). The 'QSERV' column contains cards for 'Test platform @ CC-IN2P3' (7 comments, 5/7), 'Ingest CFHT data in QSERV', 'Test QSERV with queries of scientific interest on CFHT data', 'Connection with PetaSky', and 'update shell [qserv@ccqserv001 ~]\$ which sh /usr/local/bin/sh [qserv@ccqserv001 ~]\$ sh sh:'. On the right side, there is a 'Menu' section, a 'Members' list with avatars and initials (CA, DF, EG, EN, LT, PG, RL, RA, Y, O), and an 'Activity' feed showing recent actions like 'Dominique Boutigny added Philippe Gris to this board.' and 'FabioHernandez on Test platform @ CC-IN2P3'.

Want to subscribe to these cards? [Sign up for](#)

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>

Pages Outils ▾

LSST Software User Guide

Créée par Richard Shaw, dernière modification par Frossie Economou le févr. 11, 2015

i Content for this document is still being developed. Pages that have not been reviewed for accuracy include a warning to that effect.

About this document

This guide will describe how to install the **LSST Software Stack**, how to run pipelines and other tasks, and how to configure them to develop your own data reduction applications. It will also describe the supporting packages and their use, and various key concepts that are important for understanding LSST Data. This document is geared towards end-users (e.g., Science Collaborations), other LSST Teams, and Production operators who primarily need to either analyze data, or run the pipeline code over large sets of data. DM developers and advanced users who need to know both how to run the LSST Software and how to build on top of it will also find the *LSST DM Developer Guide* to be essential reading.

In this guide

- Getting Started with the LSST Software Stack
 - Prerequisites
 - LSST Stack Installation
 - Testing the Installation
- Using the LSST Stack
 - Processing an Image File
 - Process PhoSim Images
 - Process SDSS Stripe 82 Images

Outils de l'espace ▾



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GitHub

Fichier Édition Affichage Historique Marque-pages Outils ?

Fall 2014 Fermi-LA... x Dark Energy Science C... x http://nb...sk.ipynb x http://nb...on.ipynb x http://nb...on.ipynb x Data Butler - LSST ... x lsst-france/LSST_n... x

GitHub, Inc. (US) https://github.com/lsst-france/LSST_notebooks

GitHub This repository Search Explore Features Enterprise Blog Sign up Sign in

lsst-france / LSST_notebooks Watch 6 Star 0 Fork 0

Collection of iPython notebooks for LSST

14 commits 1 branch 0 releases 2 contributors

branch: master LSST_notebooks / +

Other bug found

odadoun authored a day ago latest commit 0ce1d694c0

Check_Astrometric_Matches....	Cosmetics	4 months ago
NewFe55.ipynb	Other bug found	a day ago
README.md	First commit with notebbok to compare CFHT magnitudes as determined b...	7 months ago
Source_flags.ipynb	New notebook to retrieve source flags	4 months ago
Stellar_Locus.ipynb	Add stellar locus notebook	2 months ago
checkMagnitudes.ipynb	First commit with notebbok to compare CFHT magnitudes as determined b...	7 months ago
checkPsf.ipynb	Bug correction	3 months ago

Code Issues 0 Pull requests 0 Pulse Graphs

HTTPS clone URL https://github.com/1

You can clone with HTTPS or Subversion.

Clone in Desktop Download ZIP



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Notebook iPython

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

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

nbviewer FAQ IPython Jupyter

LSST_notebooks / NewFe55.ipynb

Fe55 analyse python notebook based on the exemple founded here <https://confluence.slac.stanford.edu/display/LSSTCAM/eotest+User+Manual> I have modified the program to skip the intermediate fits file and adapted for GE batch system (CCIN2P3 soumission jobs batches) only a the python program is sumitted ipython nbconvert --to python NewFe55.ipynb Olivier Dadoun dadoun@in2p3.fr March 2015

```
In [4]: # this is definition for CCIN2P3 GE batch system
# to avoid display problem
import os
import matplotlib
import sys
import glob
import glob
import numpy as np
import pyfits
import pylab
import lsst.eotest.sensor as sensorTest
import lsst.eotest.image_utils as imutils

if(len(sys.argv) == 2):
    ampli=sys.argv[1]
else:
    ampli="1"

#path_input="/sps/lsst/data/dadoun/input/dataFe55/113-03/"
path_input="/var/tmp/test/"
```


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

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

nbviewer FAQ IPython Jupyter

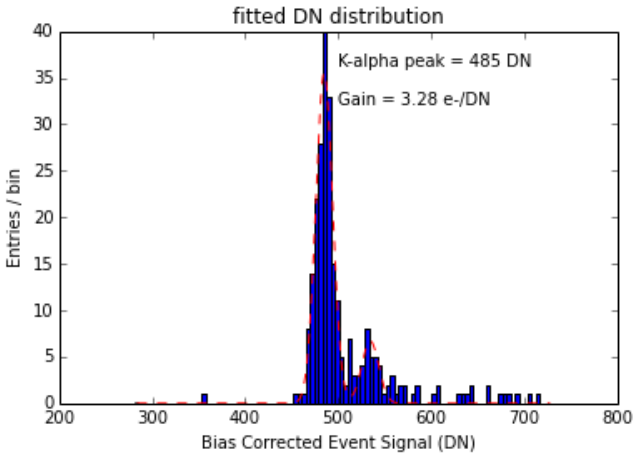
```

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_lsststest.00_008_20140709223441.fits
----> Amp : 1



Entries / bin

Bias Corrected Event Signal (DN)

fitted DN distribution

K-alpha peak = 485 DN
Gain = 3.28 e-/DN

In []:



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Liens

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

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

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