LSST

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ESCAPE
European Science Cluster of Astronomy &
Particle physics ESFRI research Infrastructures

Kick-Off Meeting
February 7-8, 2019
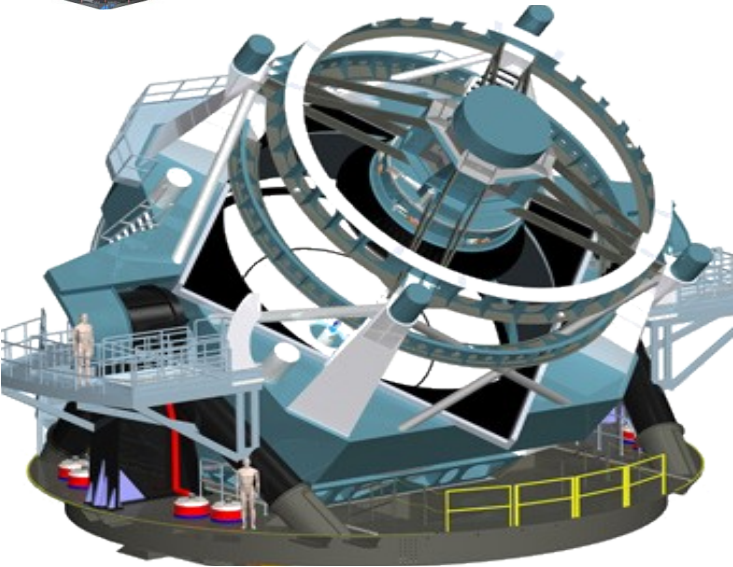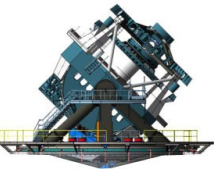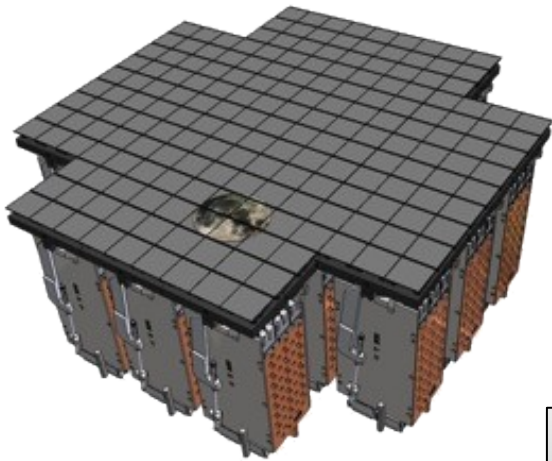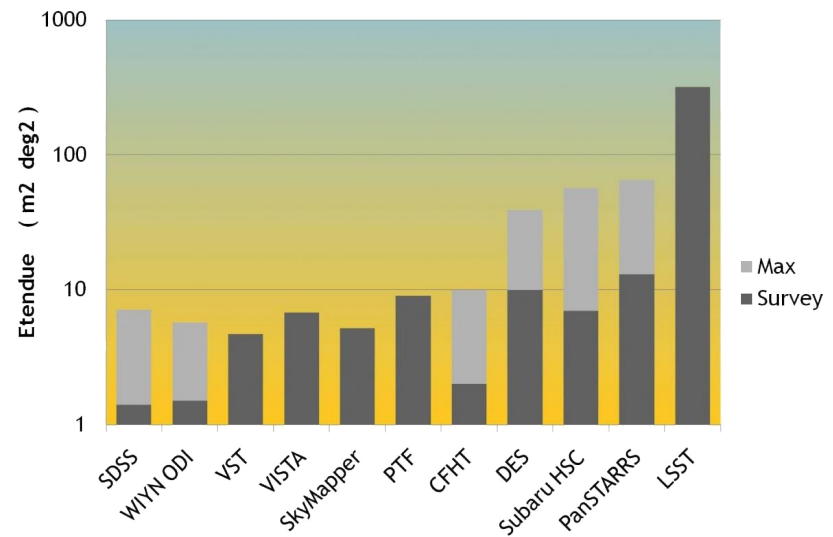
Modified Paul-Baker optical formula
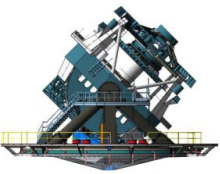D = 8.4 m (6.7m effective)
f/d = 1.23
350 t mobile structure

Étendue = surface X field of view
$\rightarrow$ LSST: 319 m².deg²

3.2 Gpixels – 0.2" / pixel
189 CCD (4k x 4k) deep depleted

Février 2017

© Wil O'Mullane
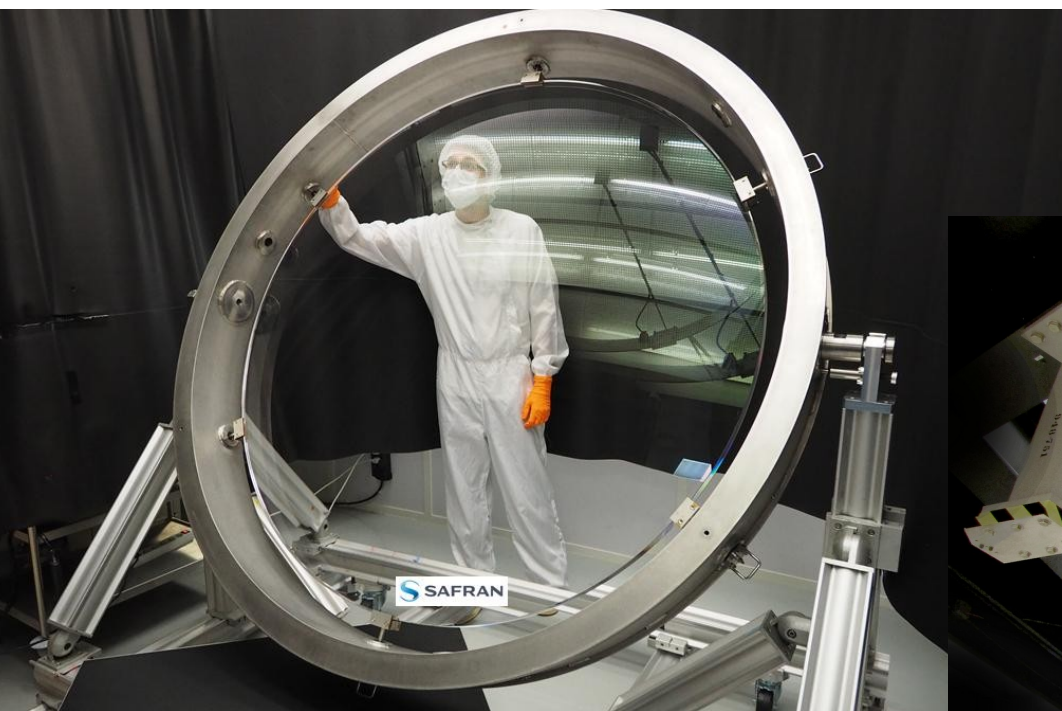
Octobre 2018
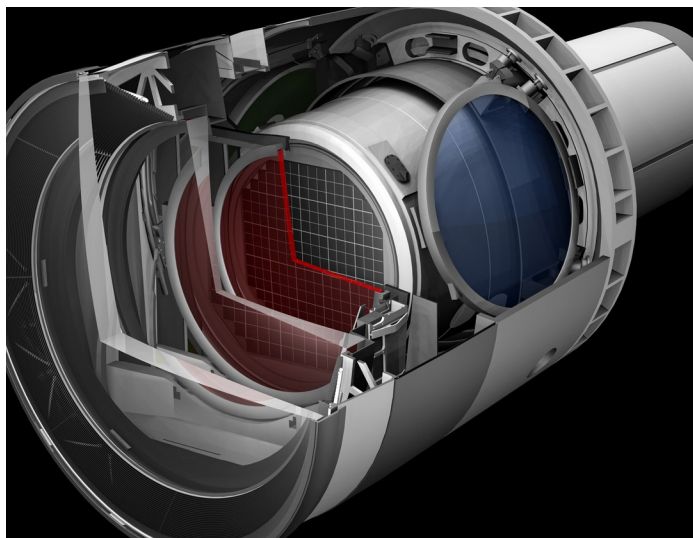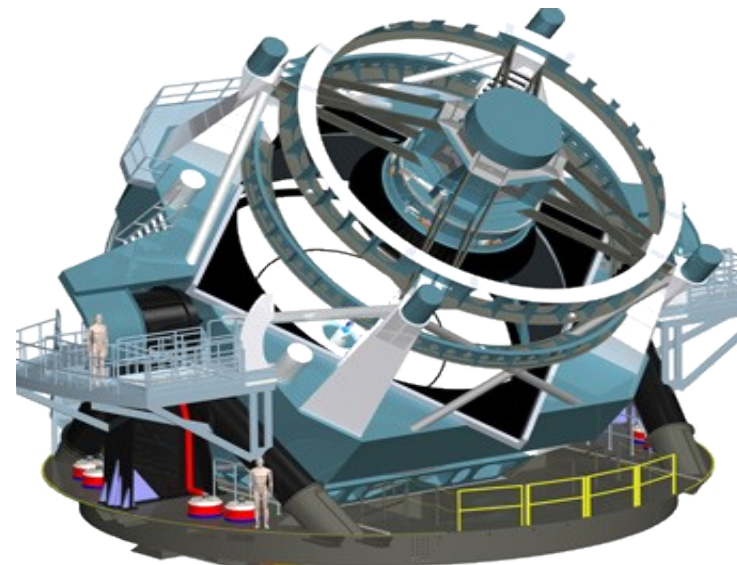
Asturfeito, S.A., Spain

CAPP

Domini
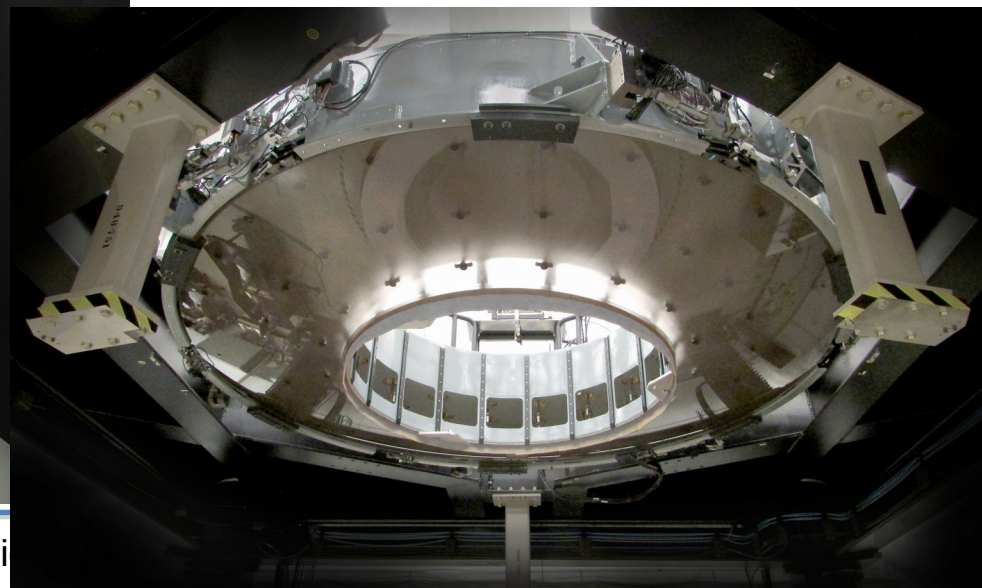
- 2.75 10^6 visits (x2 snaps x189 CCD x16 Mpixels)
- 20 TB / 24h including calibrations
- 60 PB raw data / year
- Final dataset : 500 PB total
- Peak computing power: 1.8 PFlops

50% of the processing done in France:
- *Full copy of the data in France*
  - *Catalogs*
  - *Raw images*
 - *+ some science derived products*

LSST Data Products

- A stream of ~10 million time-domain events per night, detected and transmitted to event distribution networks within 60 seconds of observation.
- A catalog of orbits for ~6 million bodies in the Solar System.

Prompt data products

- A catalog of ~37 billion objects (20B galaxies, 17B stars), ~7 trillion observations ("sources"), and ~30 trillion measurements ("forced sources"), produced annually, accessible through online databases.
- Deep co-added images.

Data Release products

- Services and computing resources at the Data Access Centers to enable user-specified custom processing and analysis.
- Software and APIs enabling development of analysis codes.

User Generated data products

Slide borrowed and adapted from Mario Jurić
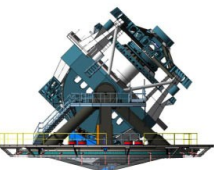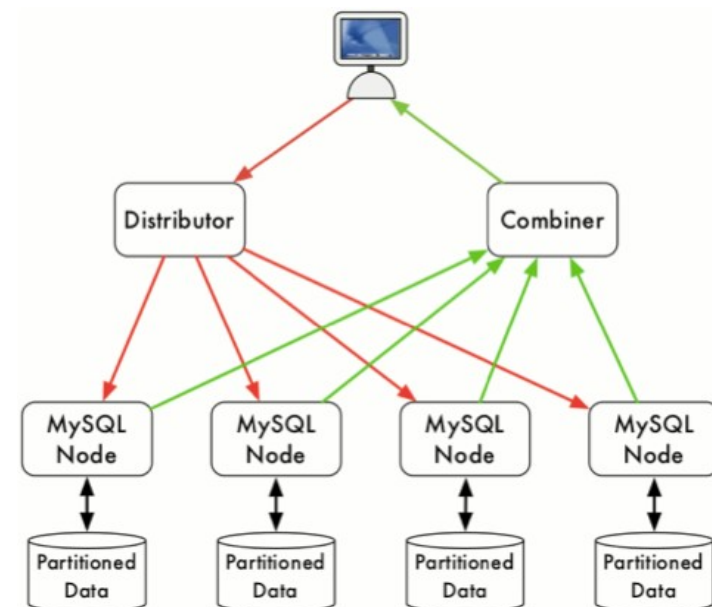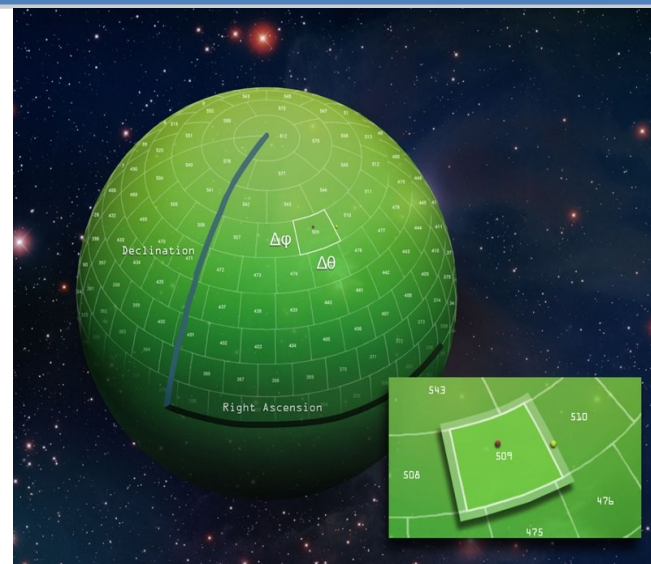
The challenge is to design an SQL database system able to store trillions of objects while keeping a the access time at a reasonable value

Qserv : developed at SLAC – Design optimized for astronomical queries
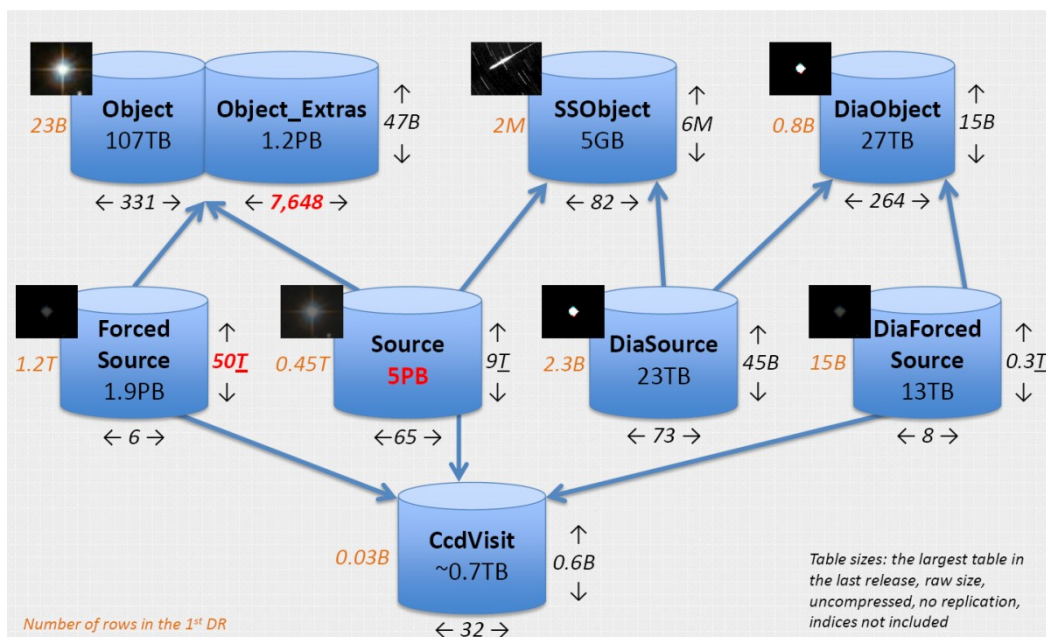
Massively parallel – distributed – shared nothing – **relational database**

Final relelease : ~15 PB

Qserv@CC-IN2P3

CC-IN2P3 has a partnership with Dell
Setup Qserv test bench
- 50 servers (2 test benches x 25 servers)
- 400 cores
- 0.5 PB disk storage

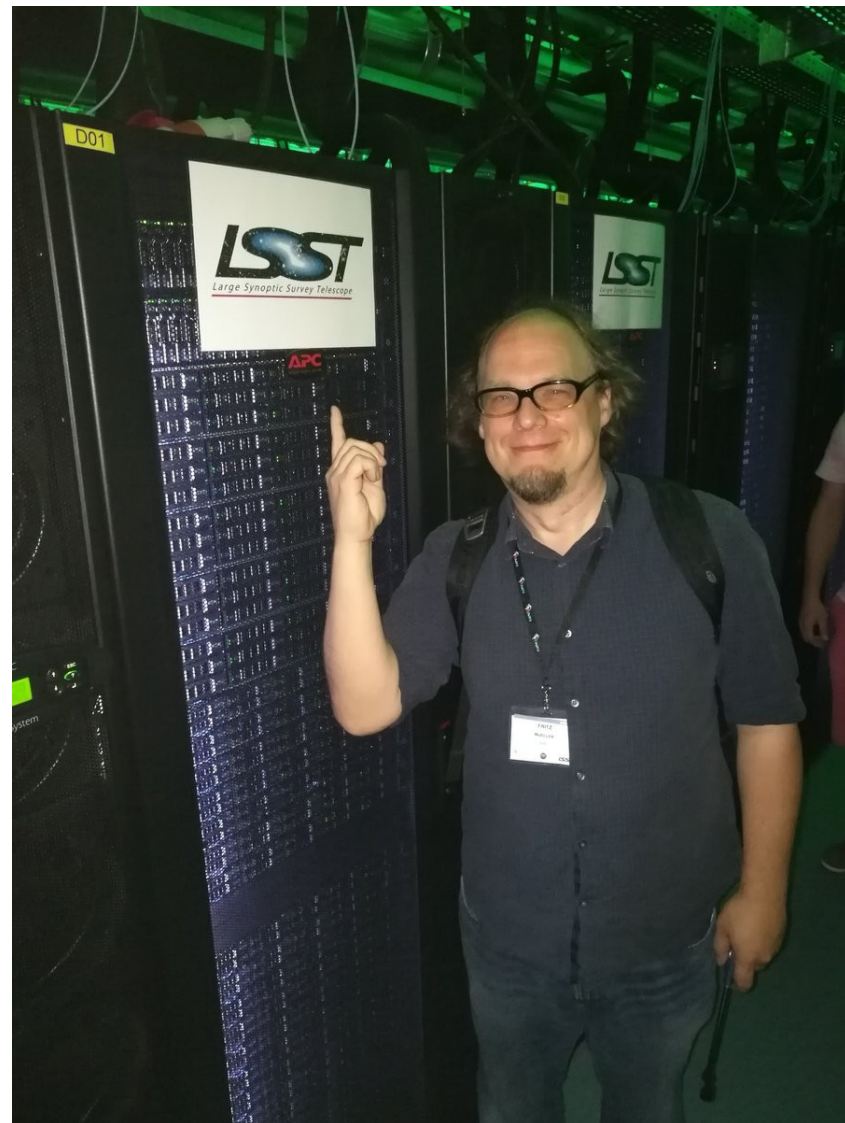# Data Access Centers (DACs)

In LSST: officially 2 DACs in Chile and at NCSA

- Sized to provide data access to ~7500 potential users
- Currently evaluating the possibility to have a few (3-4) International DAC
    - The European LSST community is getting organized

In France there will be an LSST DAC

- At minimum to serve the French LSST community
- May be extended to the European / Worldwide partners
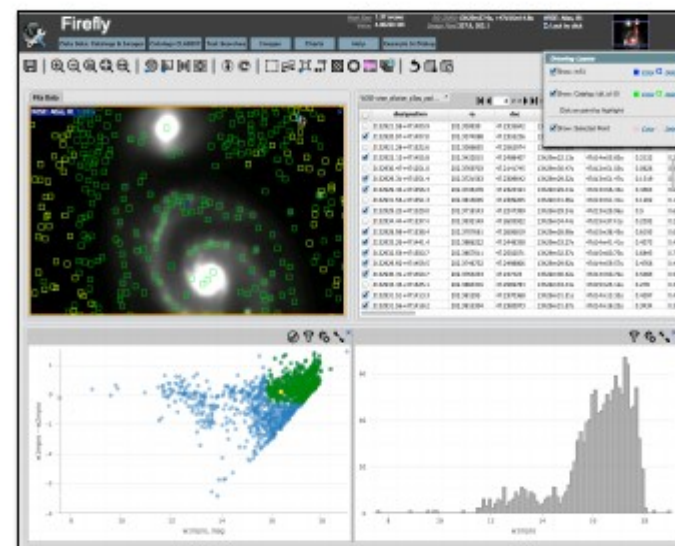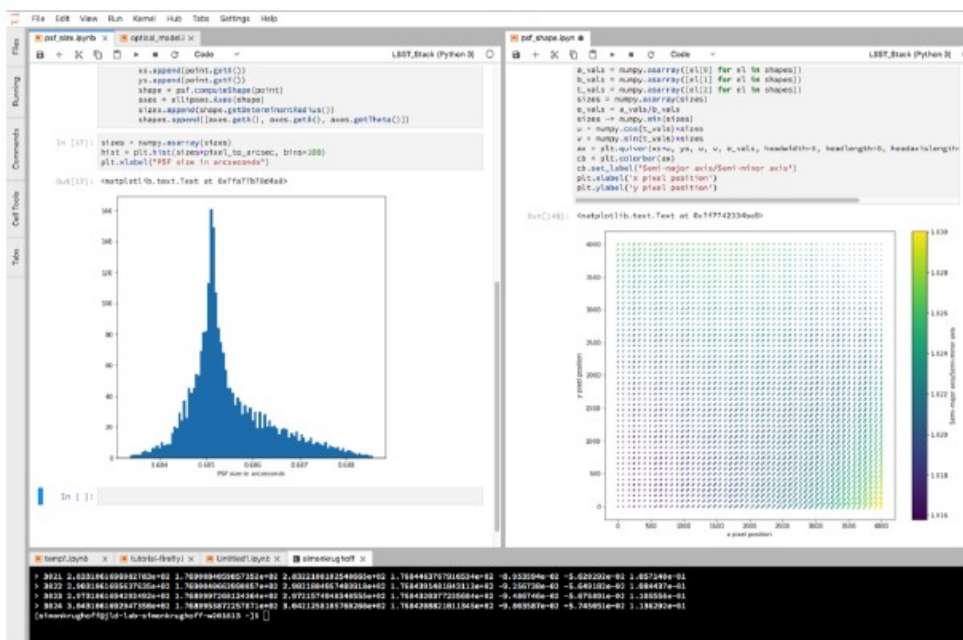
The Firefly Web Science User Interface (Wu et al, 2016; ADASS)

Science Platform

Identity Provider

Browser
Web Portal

Browser
Firefly Widgets

Jupyter Client

Firefly Servers
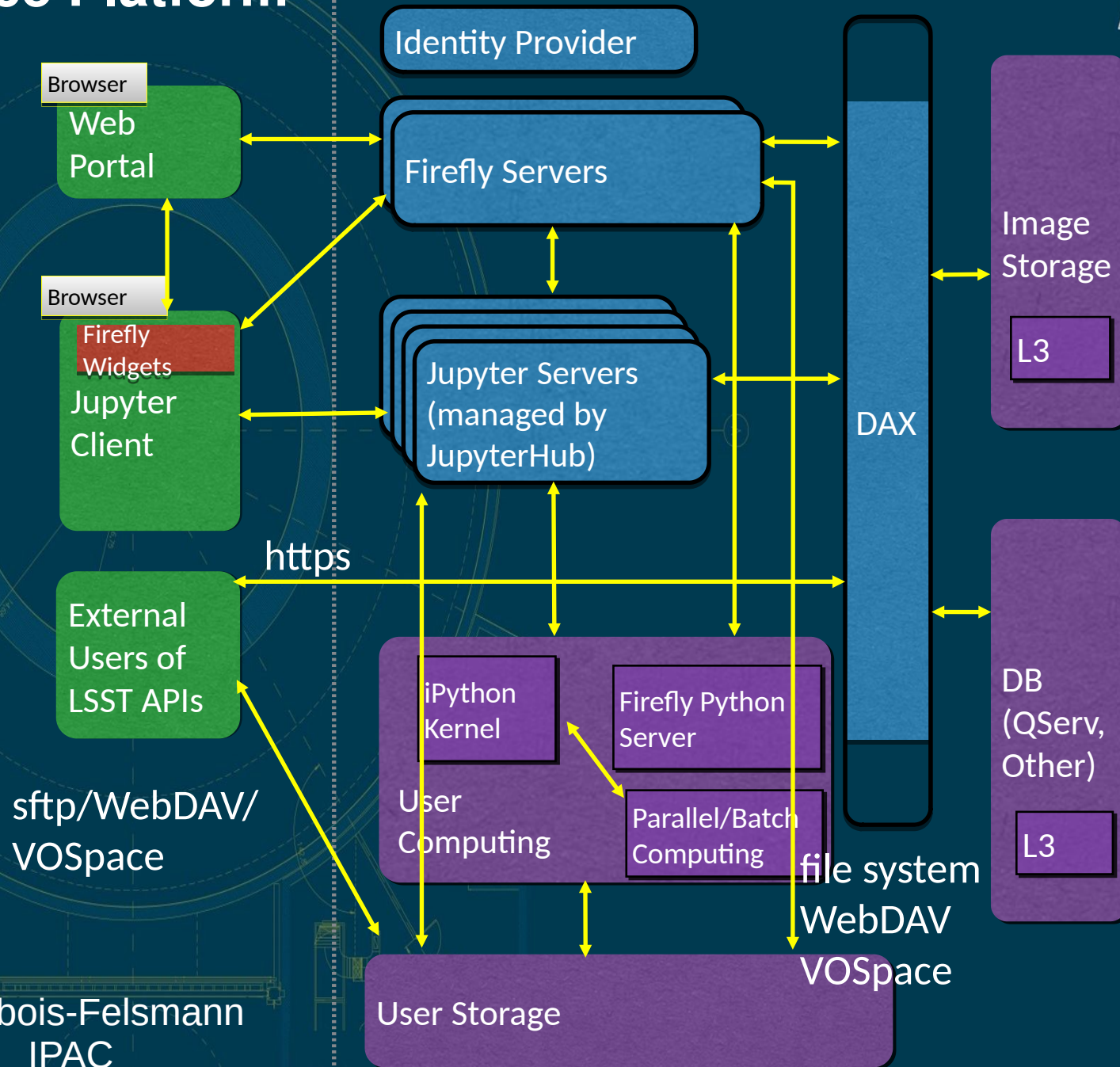
Jupyter Servers (managed by JupyterHub)

DAX

Image Storage

L3

https

External Users of LSST APIs

sftp/WebDAV/ VOSpace

iPython Kernel

Firefly Python Server

Parallel/Batch Computing

User Computing

file system WebDAV VOSpace

DB (QServ, Other)

L3

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User Storage

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DESC will produce thousands of such images + the corresponding catalogs

Nice datasets to test catalog production pipelines and science interface

- Ingest DESC DC2 data into Qserv

    - Test usability on realistic science use cases

- Deploy Data Access Center / Science Platform components

    - Test usability on realistic science use cases

- Investigate how to connect the Science platform with HTC and (remote) HPC resources

- Investigate how to interconnect / inter-operate LSST catalogs with other datasets