

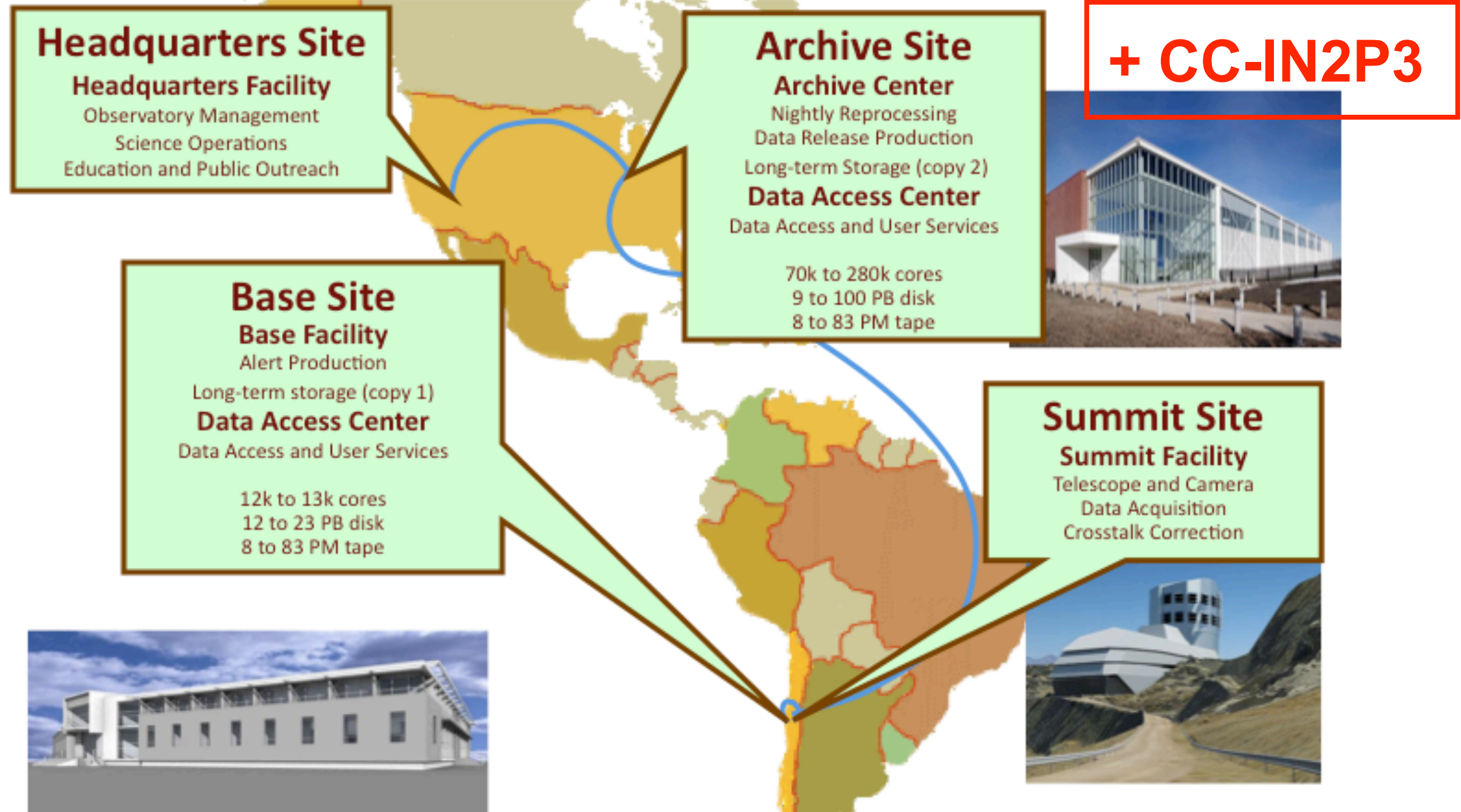
Calcul-LSST

LAL - Novembre 2012

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20 Novembre 2012

Cyber infrastructure is defined and capacity has been identified to handle data volume



- Summit-Base network will be installed by the project.
- Working with NSF funded network consortiums on capacity.
- International protected network identified and quoted.



Data Management System Layered Architecture



Application Layer (LDM-151)

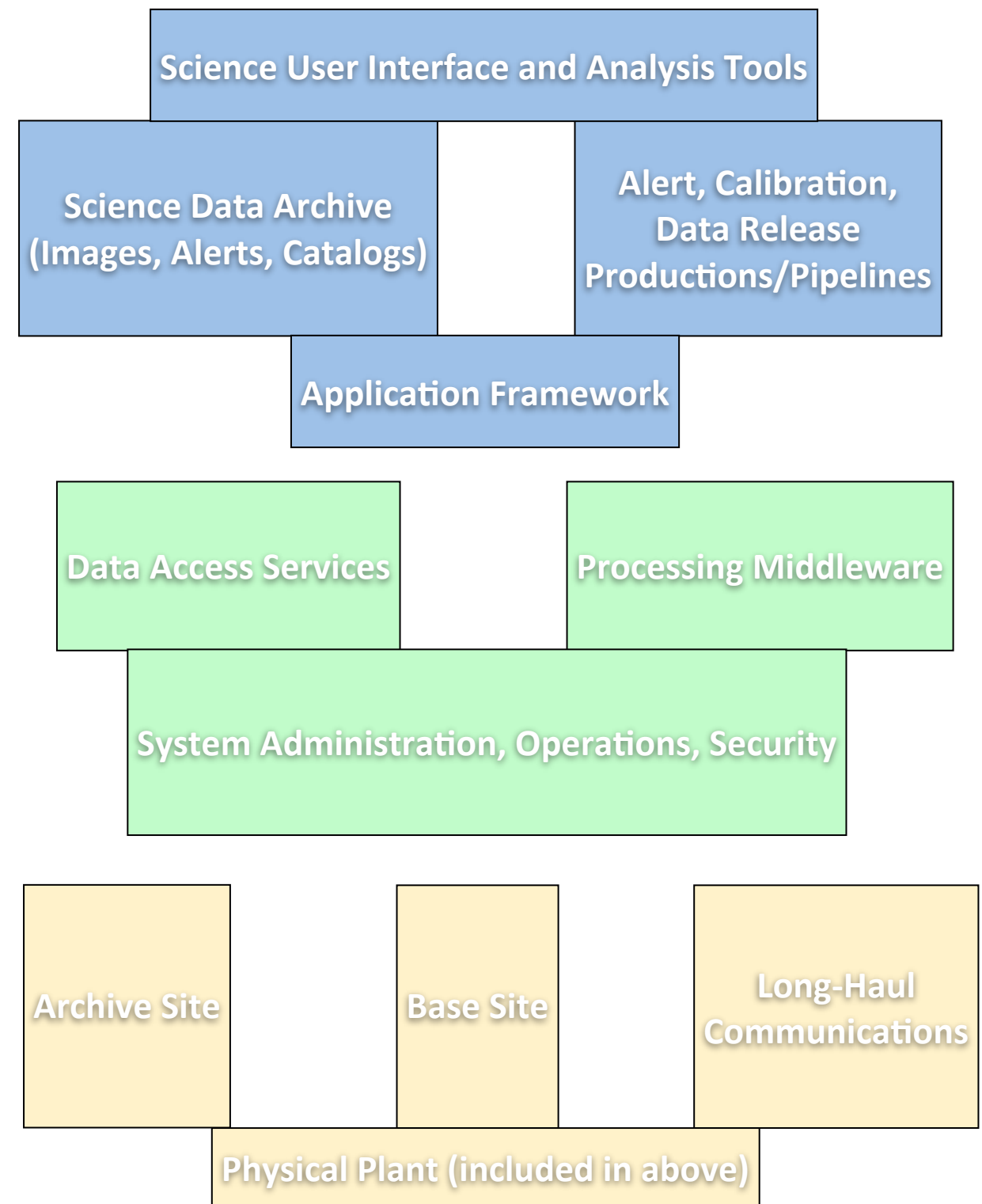
- Scientific Layer
- Pipelines constructed from reusable, standard “parts”, i.e. Application Framework
- Data Products representations standardized
- Metadata extendable without schema change
- Object-oriented, python, C++ Custom Software

Middleware Layer (LDM-152)

- Portability to clusters, grid, other
- Provide standard services so applications behave consistently (e.g. provenance)
- Preserve performance (<1% overhead)
- Custom Software on top of Open Source,
- Off-the-shelf Software

Infrastructure Layer (LDM-129)

- Distributed Platform
- Different sites specialized for real-time alerting vs peta-scale data access
- Off-the-shelf, Commercial Hardware & Software, Custom Integration



Data Management Faces Many Challenges



- LSST Data Management system must deal with an unprecedented data volume.
 - one 6-gigabyte image every 17 seconds
 - 15 terabytes of raw scientific image data / night
 - 100-petabyte final image data archive
 - 20-petabyte final database catalog
 - 2 million real time events per night every night for 10 years
- The software, framework and database designs are in place for highly reliable open source system.
- Infrastructure is identified and anticipates modest technical advancement consistent with trends.

LSST computing levels

- ❖ A- Data acquisition / primary storage (Cerro Pachon / La Serena - Chile)
- ❖ B- Nightly processing: alerts & transients (NCSA)
- ❖ C- LSST data processing pipeline (NCSA, CC-IN2P3)
 - ❖ **Data management : DBMS & data access → PetaSky**
 - ❖ Image processing, calibration
 - ❖ Object detection & catalogs , time series (light curve, proper motion)
 - ❖ photo z
- ❖ D- Dark Energy science data analysis (WL, SN, P(k)/BAO, clusters ...)
- ❖ E- Public data release

LSST-computing

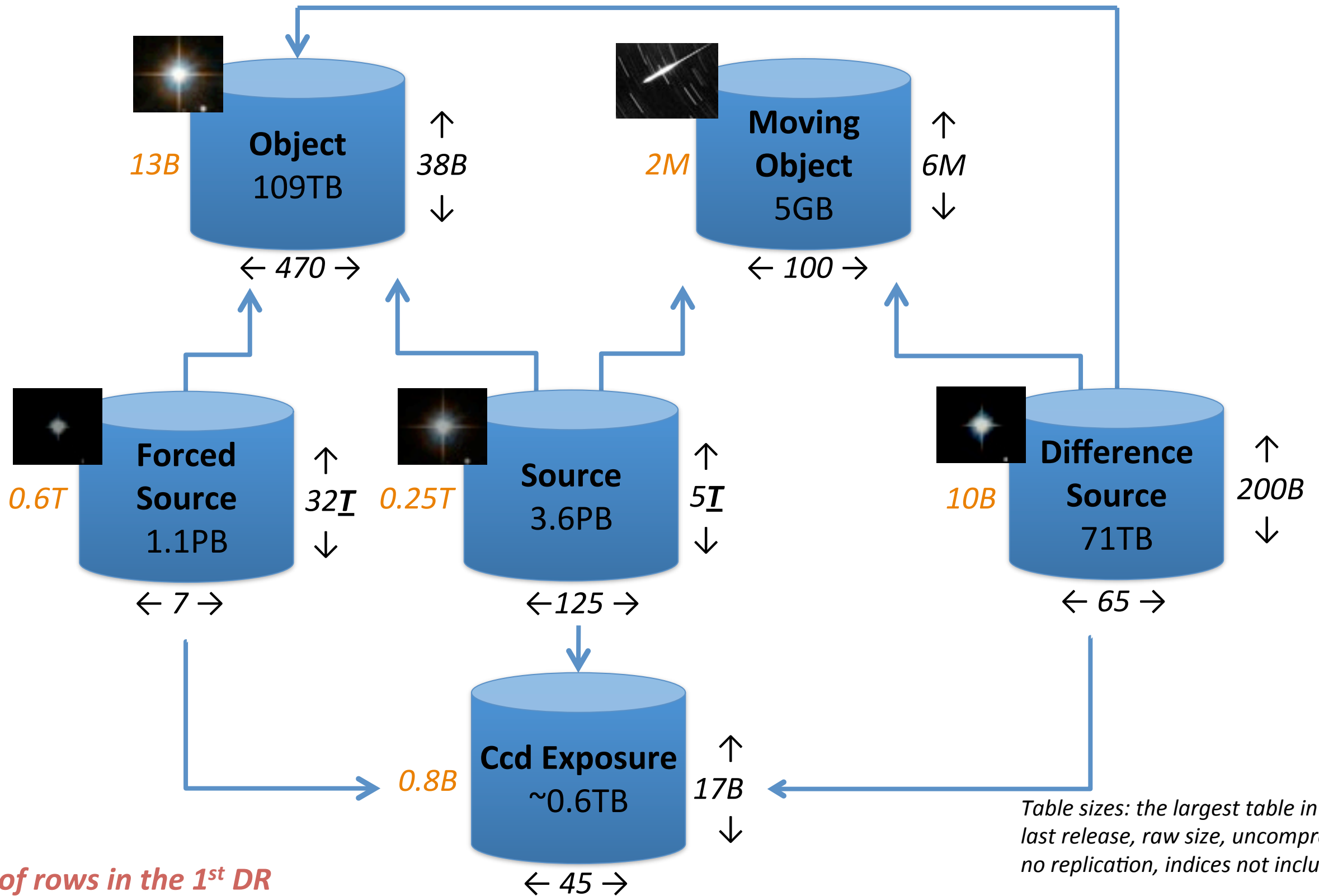
- ❖ Un des trois principaux sous-projets de LSST :
 - ❖ Télescope et site
 - ❖ Caméra
 - ❖ Calcul, Distribution des données (~ 1 / 4 du coût total, 140 M\$)
- ❖ Calcul sous la responsabilité de NSF principalement, Jeff Kantor et M. Juric et forte implication de SLAC
- ❖ **Architecture OO, C++ / Python** - Base de données distribuée (Qserv)
- ❖ Participation française à hauteur de 50% de la production du niveau C : R.A, C. Arnault (coord. technique), D. Boutigny, D. Fouchez

PetaSky

- ❖ Groupe 1 : accès aux données, bases de données
- ❖ Groupe 2 : Analyse d'images et Visualisation
- ❖ Groupe 3 : fouille des données, apprentissage
- ❖ Laboratoires impliqués:
 - ❖ LIMOS (Clermont-Ferrand) - F. Toumani
 - ❖ LIRIS (Lyon)
 - ❖ LPC-Clermont - E. Gangler
 - ❖ CC-IN2P3
 - ❖ APC
 - ❖ LAL
- ❖ Journée MASTODONS CNRS 5 Décembre 2012

Compléments

LSST Database



Number of rows in the 1st DR

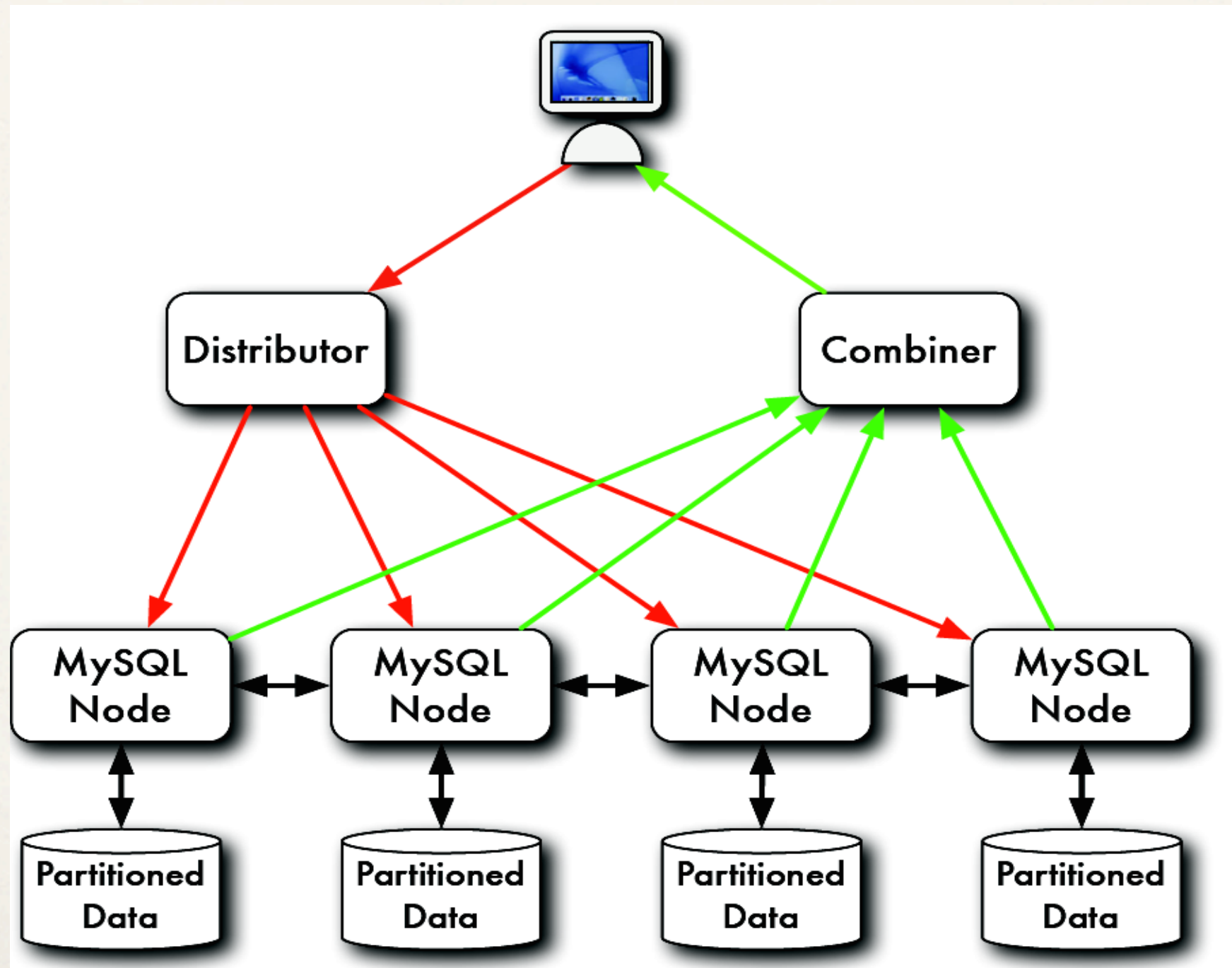
LSST catalogs

Table	Size [TB]	rows	columns	description
Object	109	~38 billion	~500	Most heavily used, for all common queries on stars/galaxies, including spatial correlations and time series analysis using summarized information
CalibSource	24	~100 billion	~25	Sources used for calibration
DiaSource	71	~200 billion	~50	Alert-related follow up analysis
Source	3,600	~5 trillion	~100	Time series analysis of bright objects and detections
ForcedSource	1,089	~23 trillion	~7	Specialized analysis of faint objects and detections

PetaSky

- ❖ Masse de données (1-10 PB) / architecture du DMS
 - ❖ Système parallèle et distribué
- ❖ Gestion de données hétérogènes (LSST / EUCLID / ...)
 - ❖ Lien avec VO (Virtual Observatory)
- ❖ Traitements complexes (images, corrélation de catalogues d'objets ...)
- ❖ Visualisation (Voir VO aussi)
 - ❖ LIMOS (Clermont-Ferrand) - F. Toumani
 - ❖ LIRIS (Lyon)
 - ❖ LPC-Clermont (E. Gangler) CC

Parallel processing/storage (MPP)



Query Access prototype (Qserv) implementation

