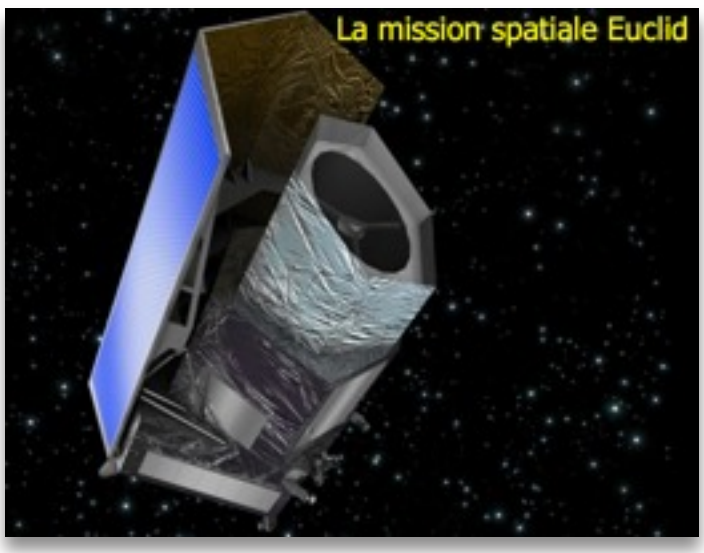
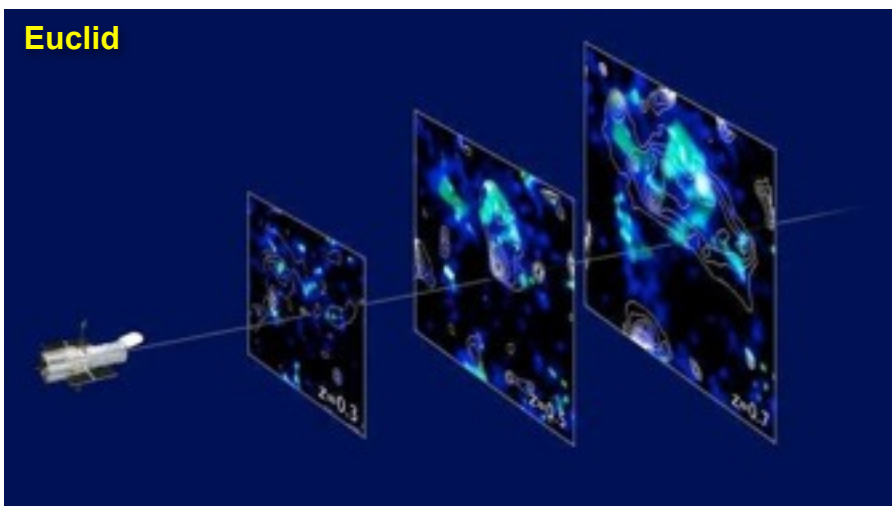
# Euclid OULE3

Jean-Luc Starck
on behalf of the OULE3 team



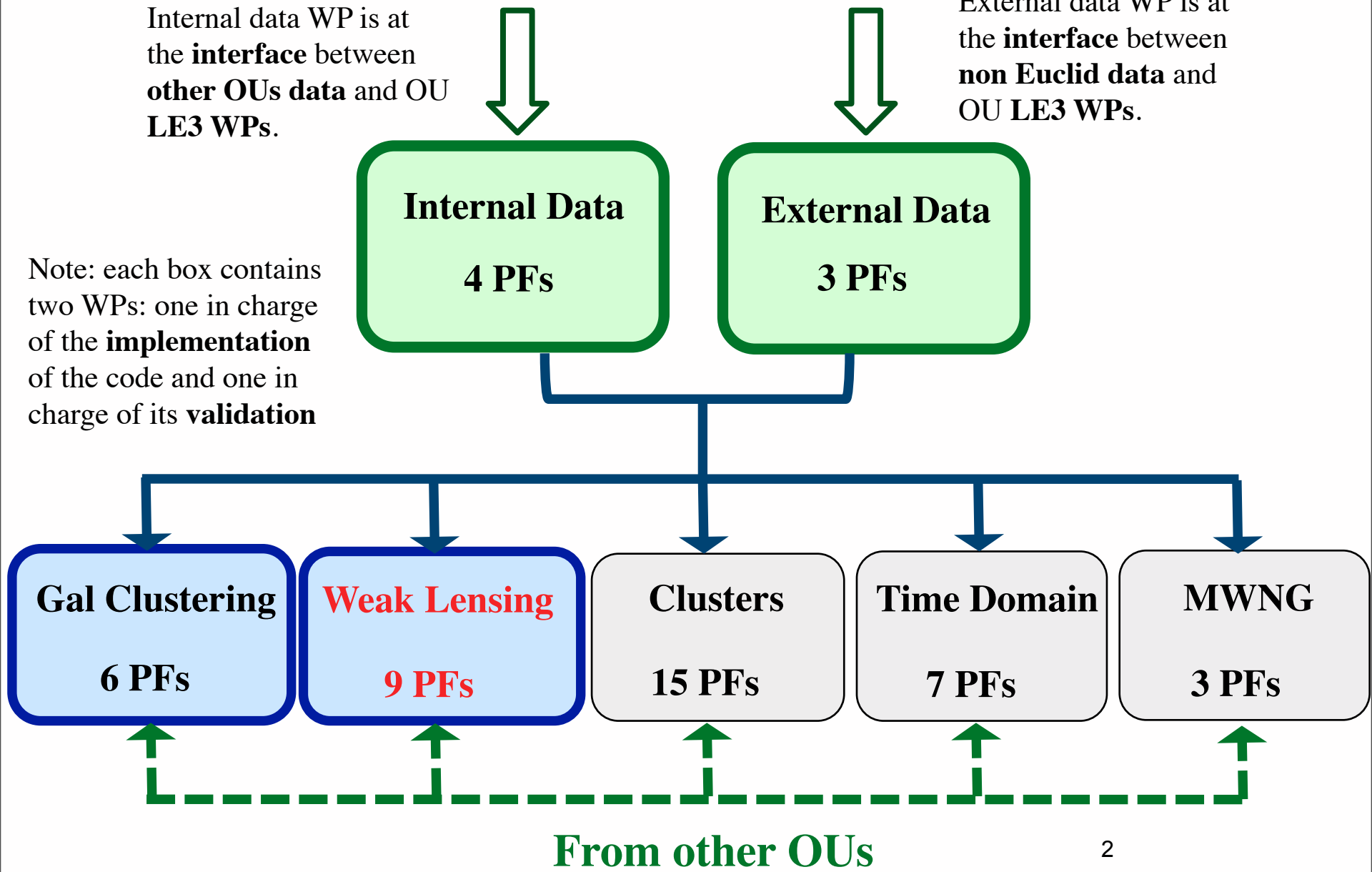

http://wiki.cosmos.esa.int/euclid/index.php/EC_SGS_OU_LE3

# OU-LE3 Internal Structure



Internal data WP is at the **interface** between **other OUs data** and OU **LE3 WPs**.

External data WP is at the **interface** between **non Euclid data** and OU **LE3 WPs**.




Note: each box contains two WPs: one in charge of the **implementation** of the code and one in charge of its **validation**

**47 Processing Functions (PF)**

The last 18 months have intense in term of documentation:

- **SRR Documents: V1.0 in July 2014,**
  **V2.0 in October 2014**
  **V3.0 in December ....**
  **V4.0 delivered on July 15.**
  - Requirement Specification Document (RSD):
  - Validation Plan Document:
  - Development Plan Document
  - LE3 required simulation Document
  - Flowdown matrix requirement table
- LE3 RIDs answer (Feb 2015)
- LE3 Actions answer (July 2015)

RIDs: 6 majors + 5 minors => **7 actions**

The four main actions consisted in answering these points:

- **Impossibility** to reach a Maturity Level 2A at SGS PDR for all the LE3 PFs
  - Wide scope and large number of LE3 PFs
  - Low number of skilled C++/Python developers within LE3 organization (OU and SDC)

- **Significant number** of TBCs/TBDs in GDPRD requirements directly impacting LE3 processing.

- **Clarify** the input **catalog** for LE3

- Error propagation

# Closest Developers



| | 2015 | 2016 | 2017 | 2018 | 2019 |
|---|---|---|---|---|---|
| FR - WL | 0.8 | 1.8 | 2 | 2 | 2 |
| FR - Clusters | 0.95 | 0.95 | 0.25 | 0.25 | 0.25 |
| IT - Clusters | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |
| IT - Galaxies | 1.9 | 2.4 | 2.4 | 2.4 | 0 |
| FR | 1.75 | 1.75 | 2.25 | 2.25 | 2.25 |
| UK (WL) | 0.9 | 0.9 | 0.9 | 0.9 | 0.2 |
| IT | 2.4 | 2.9 | 2.9 | 2.9 | 0.5 |
| TOTAL | 5.05 | 5.5 | 6.05 | 6.05 | 3.65 |

**Around 5-6 FTE per year, with only 3 real software engineers from SDC.**

**- P1 : PFs related to GDPRD Requirements (Primary Core Science) :** primary goals of the project (i,e. cosmological parameters)

**Examples of P1 PFs are 2-point statistics for galaxy clustering and weak lensing.**

**==> 12 PFs**

**- P2: PFs related to Cosmology + Existing algorithms + Available manpower (secondary Core Science:** cosmologically relevant information

**Examples of P2 PFs are mass mapping, 3-point statistics and galaxy clusters detection.**

**==> 6 PFs**

**- P3 Other PFs related to Legacy Science, but with no available manpower.**

**Examples of P3 PFs are all PFs that will deliver data products for galaxy cluster science.**

**==> 22 PFs**

**- P4 PFs with no existing requirements (mainly PFs with requirements depending on the survey strategy):** Also Legacy Science.

**Examples of P4 PFs are all PFs that apply to transient phenomena.**

**==> 7 PFs**

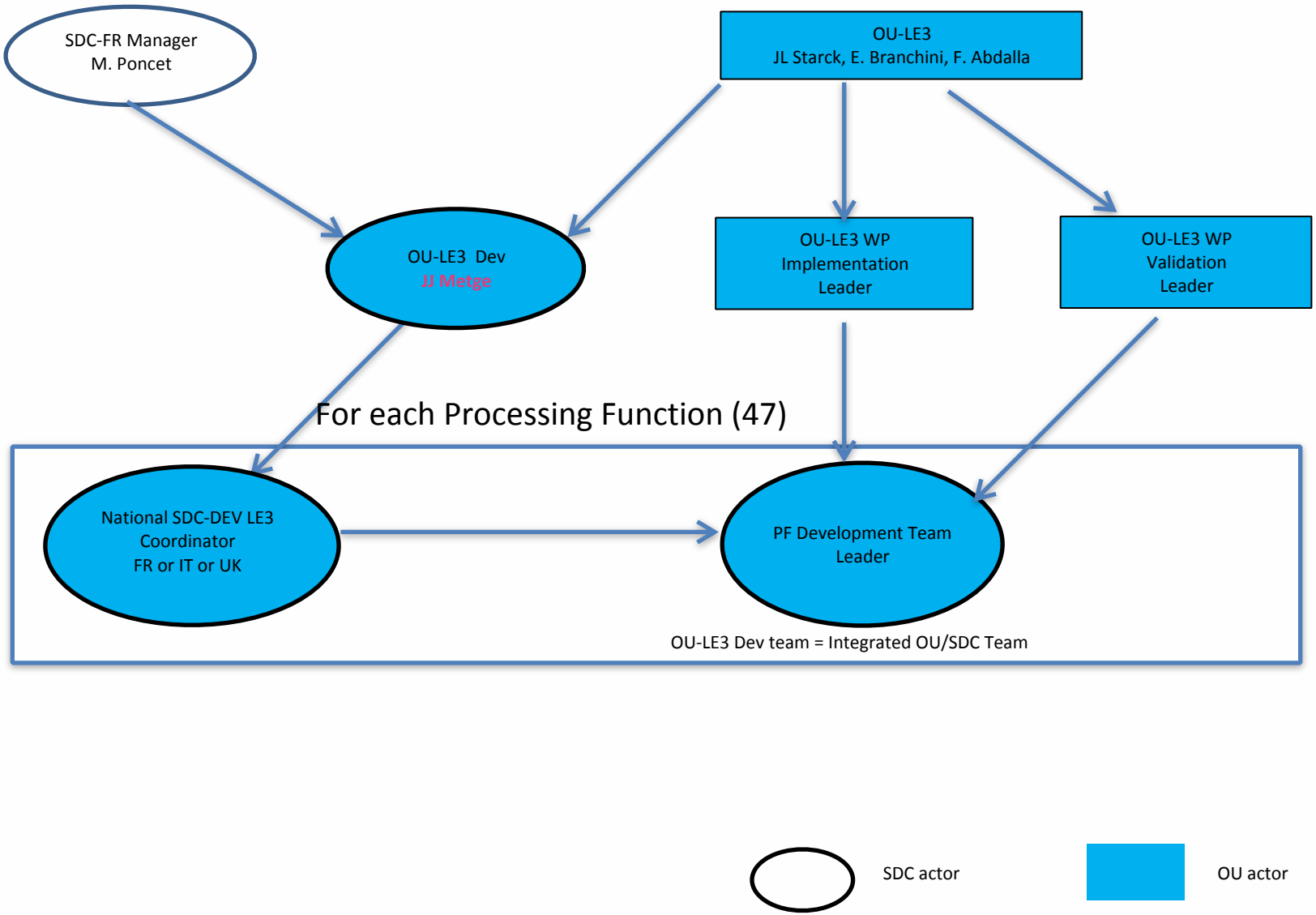
# LE3 development policy

- Give maximum priority to P1 and P2 PFs development :
  - Development objectives for PFs ranked P1 :
    - Start code migrations into CODEEN environment :
      - Use C++ and/or Python
      - Use reference CODEEN libraries (local derogations accepted)
    - Increase Maturity Level of the PFs, ideally up to 2A
    - Implement Data Model according to Euclid rules
    - Perform sizing and performances analyses
  - Development objectives for PFs ranked P2 :
    - For each PF, perform trade-off analyses between prototypes migration into CODEEN environment and reuse of Third Party Software (see next slide)
    - Perform sizing and performances analyses
- Provide punctual support to OU-LE3 prototyping activities of P3 and P4 PFs

From Jean-Jacques Metge

# LE3-Reorganisation April 2015

Euclid Consortium



# Third Party Software : definition

- Use of Third Party Software can be considered for :
  - The implementation of any P2 or P3 or P4 PF
  - The implementation of any V&V code used for the validation of any PF (from P1 to P4)
- Third party software :
  - Are submitted to formal derogation requests
  - Do not have to comply with CODEEN rules, but with a set of specific alleviated rules (see next slide)
  - Can be exceptionnally developed in other languages than C++ and Python (and consequently hosted as « standalone packages », ie binary code compiled outside the CODEEN environment)
  - Will have IN ANY CASE to :
    - respect CODEEN packaging standard, repository
    - be deployed in SDC-PRODs through CODEEN

From Jean-Jacques Metge

# LE3-Implementation Activities

- **WL:** 2PCF PF - Good progress of the new full C++ 2PCF-WL code. A first C++ version of the code has been delivered.

- **Gal-clustering:** 5/6 PFs (including all P1) have passed the first Maturity Level Gate. For the sixth one (Bispectrum) a C++ code has been implemented. Its performances are being assessed. The flagship code (2-pt correlation function) is being reengineered and paralleled by SDC-IT. Code challenge ongoing for the C++ power spectrum code.

- **Clusters:** Main focus on the (P1) closer finder code. Third code-challenge completed. Results are being x-compared. Code for cluster richness implemented and applied to real data. Code developed which is relevant to the estimate of the cluster selection function.

# 2PCF Weak Lensing Agenda



- ML1B : in February 2016
- ML2A: in June 2016 - by the technical Key Point 1- SGS-TK1
- Status
  - New python code of the 2PCF position-position estimator has been implemented
  - Docs ready (code, user manual, SDD, performance doc, …)
  - Code ready
  - Tests ready – unitary – mock – validation
  - it provides Shear-shear 2PCF, Shear-position 2PCF, Position-Position 2PCF estimators.
  - it provides E-/B-mode second-order statistics.
  - From FITS/ASCII files and  Cartesian/Spherical coordinates,
  - and Linear/Logarithmic scales.
- Performance
  - C Athena code is the reference
  - Relative precision reached : 1e-6/1e-7
  - 10% faster

# LE3-Validation Activities

- **Weak lensing:** a python pipeline has been written which takes in input a catalog, reconstruct a mass map or an aperture mass, and count the peaks. It should be very useful to set up requirements for mass mapping.

- ongoing test with MICE simulations.

- ongoing discussions on partial validations (requirements are not there).

- **Gal-clustering.**. Validation ongoing for 2 PFs: 2-point correlation and power spectrum. 2 main activities. Code challenge on existing Euclid-mock light-cone catalogues (Durham). Creation of ideal locks with known 2-point clustering statistics and application of existing codes (Trieste).

- **Clusters.** Validation activity is identified with code challenges. Challenge n. 3 just completed for cluster finders.

# Conclusions



- OU-LE3-DEV has a clear plan, with different levels of priority.
- More interactions with both the SWGs and the SDCs.
- The SWG Requirement Development plan is very late relative to the SDC development plan:

➔ it is a problem for algorithm selection (especially when several alternative methods exist; e.g. mass mapping).

➔ one solution is to implement basic algorithms, and to change them when the requirements are there (this requires flexibility from SDC) .

- **Risks** for LE3

➔ Most requirements remain TBD.

➔ Management of the E2E pipeline: segments involved in some PFs in which LE3 is responsible for the deliverable, is in control of the final step, but does not (and should not) control o the previous steps. The risk here is related to the assumption that the pipeline is guaranteed to work.

➔ Software **engineer FTE** remain **weak** for LE3.

Athena code = WL 2PCF code in C, available on the web and used in large projects (CFHTLens).
Estimated Workforce required to achieve 2A maturity level : 1.2 FTE

➔ SDC computer may not be well adapted to LE3.

➔ The use of third party software may not be possible.

- Next LE3 Meeting, Milan, January 25-27, 2016 http://euclidgc2016.brera.inaf.it