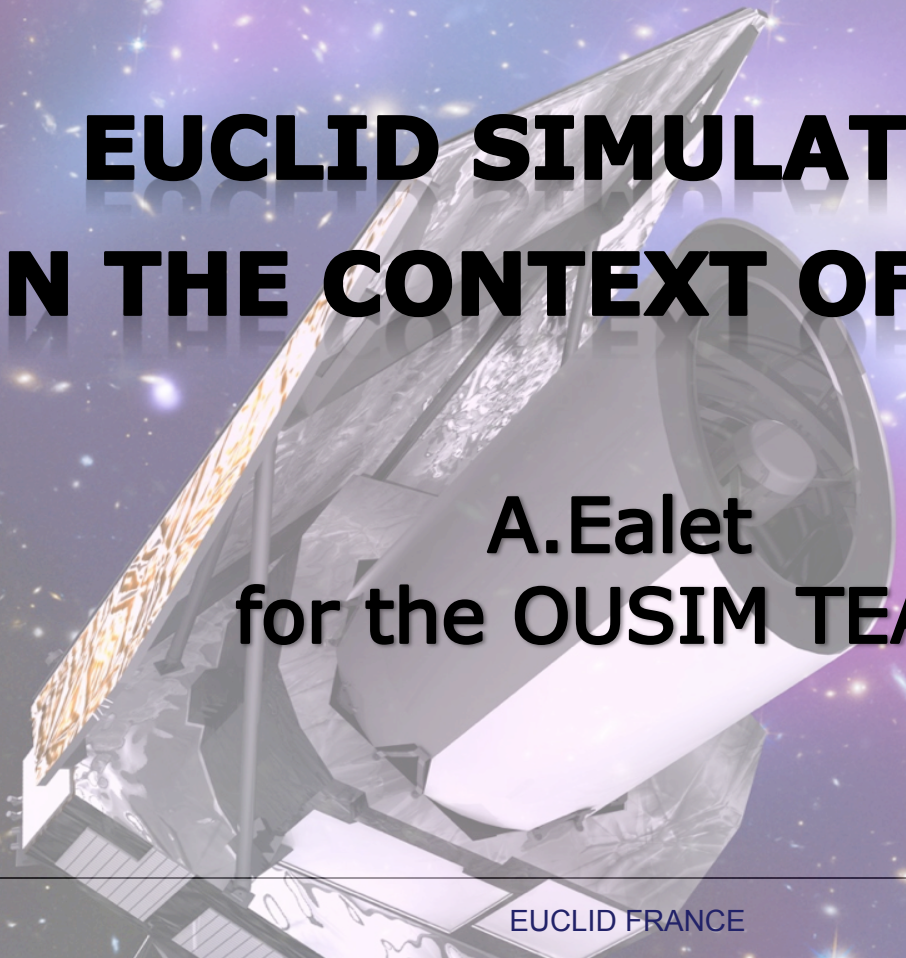


EUCLID SIMULATIONS IN THE CONTEXT OF OUSIM

A.Ealet
for the OUSIM TEAM

PF OUSIM GOALS

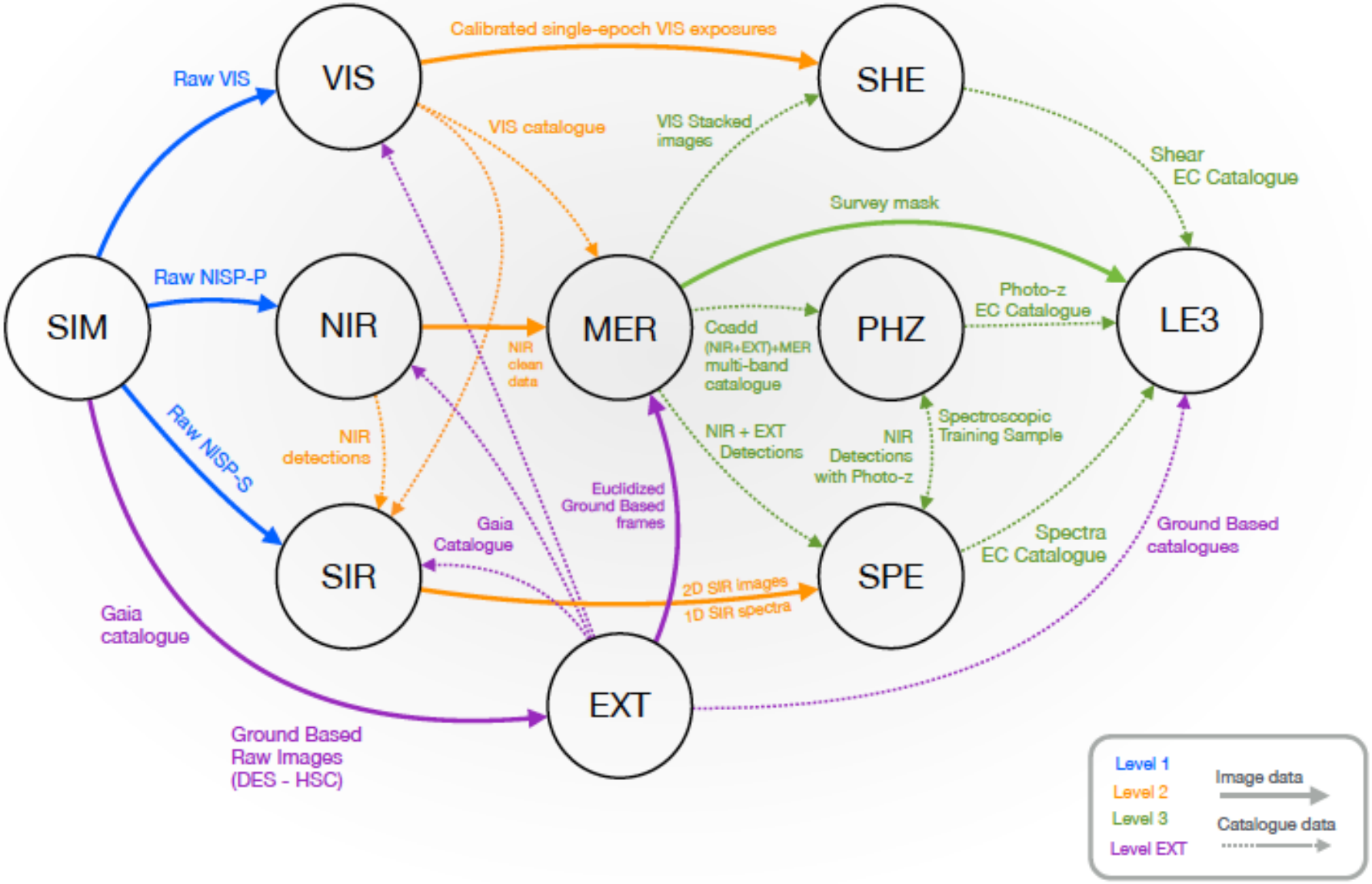
-DEVELOP ALL SIMULATIONS NEEDED TO TEST THE SGS PIPELINE

-PRODUCE SIMULATIONS NEEDED BY THE E2E GROUP

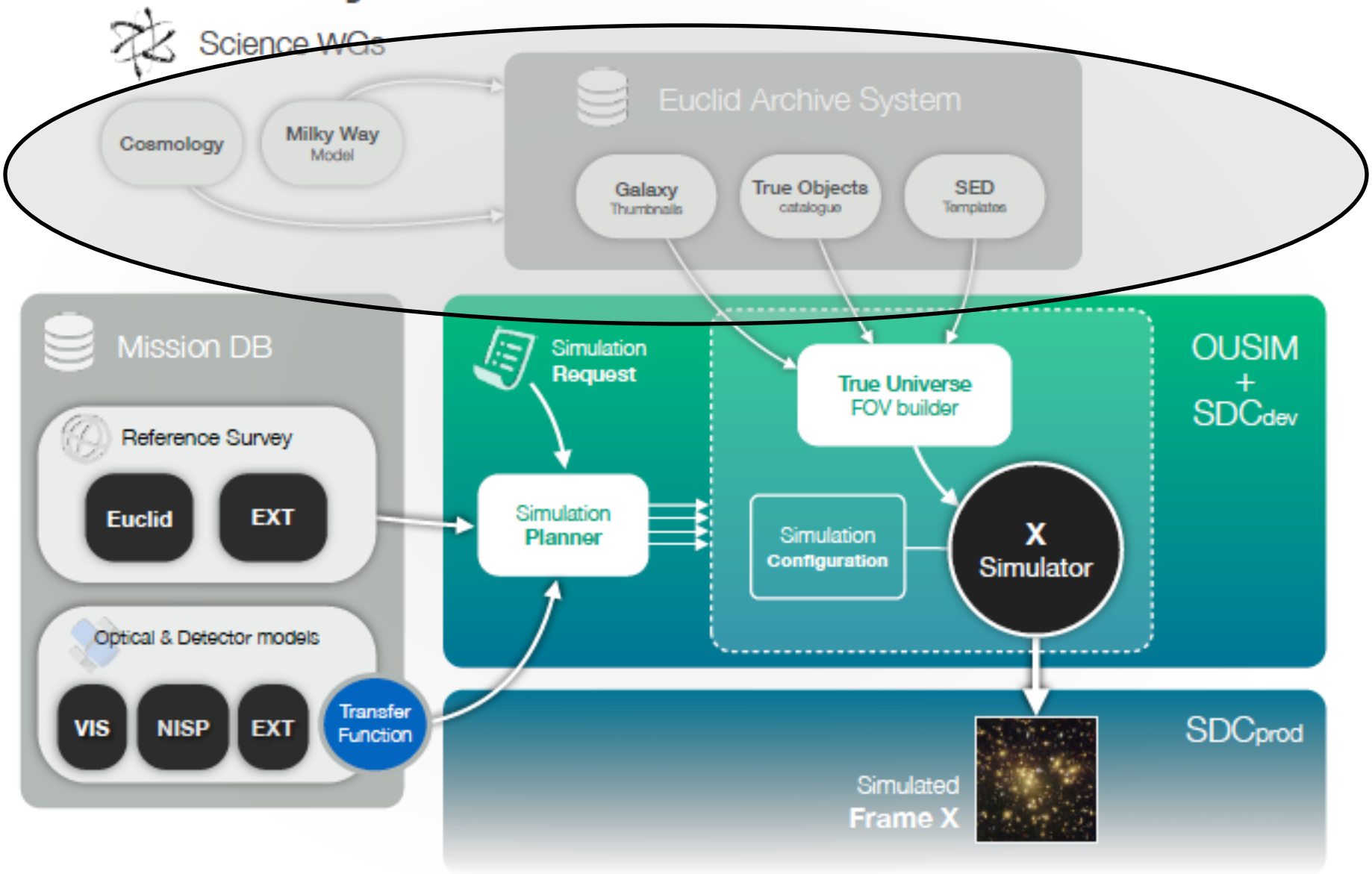
-IN A COHERENT AND INTEGRATED FRAMEWORK
-IN THE SDC ENVIRONNEMENT
-WITH THE SYSTEM TOOLS
-FOR MASSIVE AND DISTRIBUTED PRODUCTION

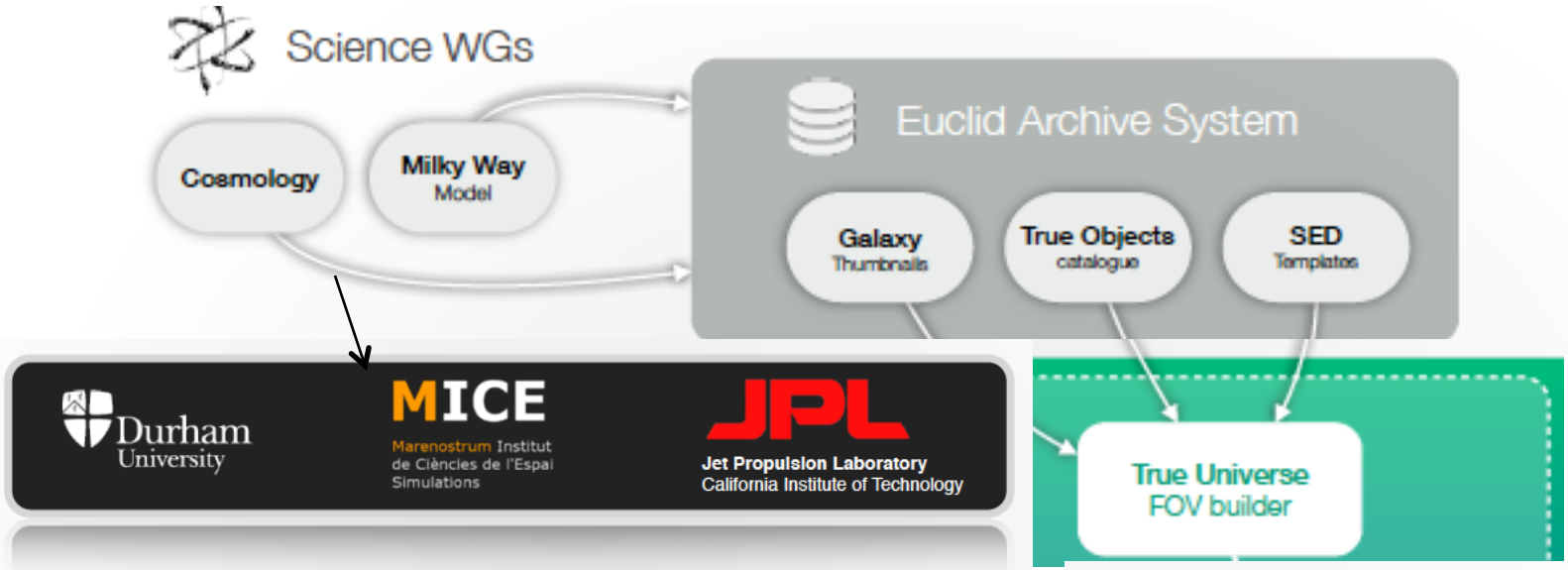
what are we simulating

and what we are not



system overview OUSIM





- Mocks produced using either *Semi-Analytical Models* or *Halo Occupation Distribution* over the **dark matter lightcone**
- Morphology & color gradients from either
  - analytical profiles
  - deconvolved realistic galaxies (i.e. HST)
- CSWG Shear + Convergence + Magnification maps for galaxy distortio

BESANÇON & TRILEGAL models

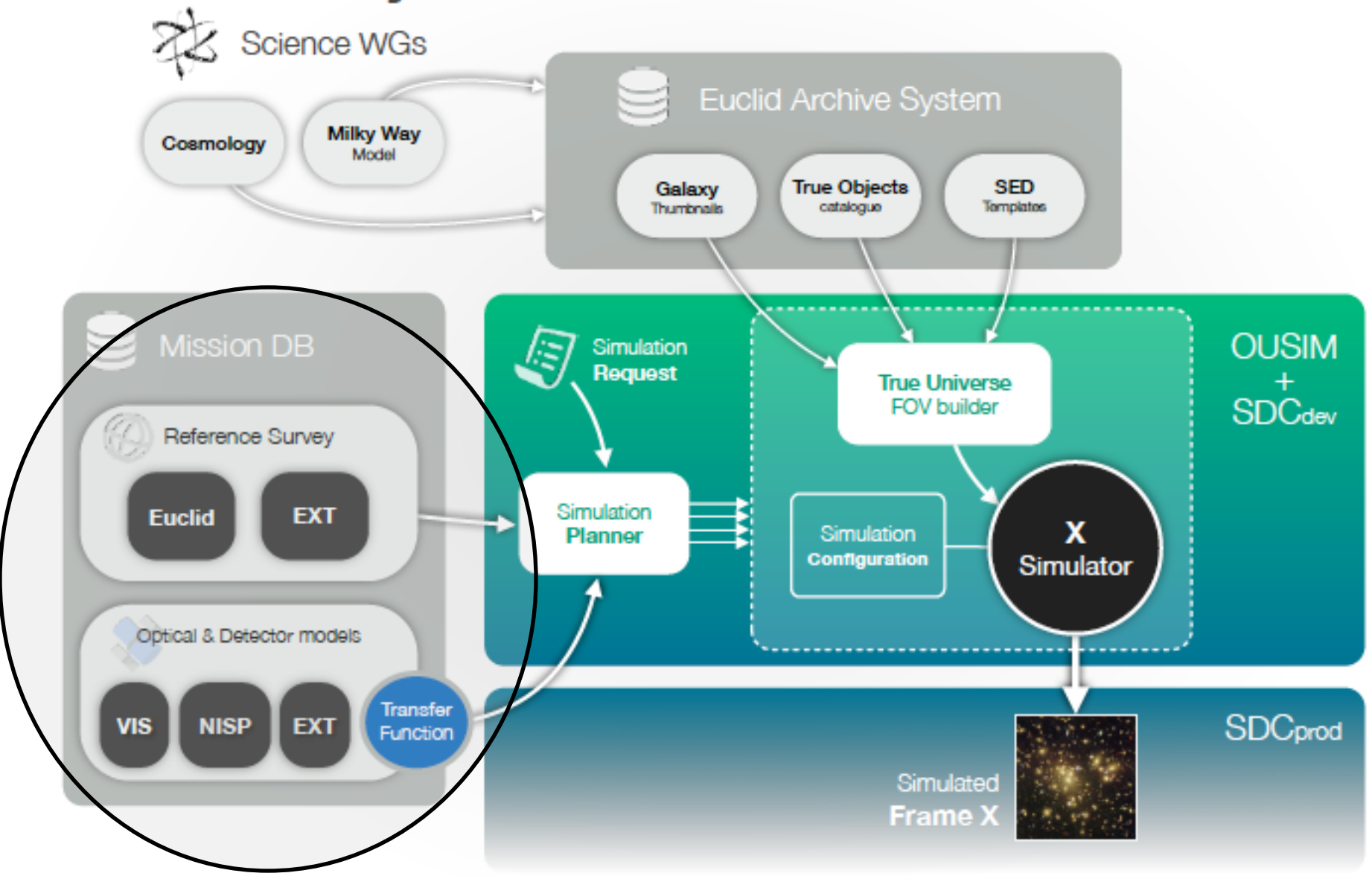
- No photometric errors, Schlegel extinction is assumed
- SED template libraries: Basel 2.2 / Padova
- For each star we calculate its SED doing an interpolation for the parameter space in Teff, logg and [Fe/H]
- Run model for $0 < l < 360^{o}$ and $|b| > 20^{o}$
  - All sky **Besançon** model simulation

    H<24 complete: 7.34x10e+08 stars

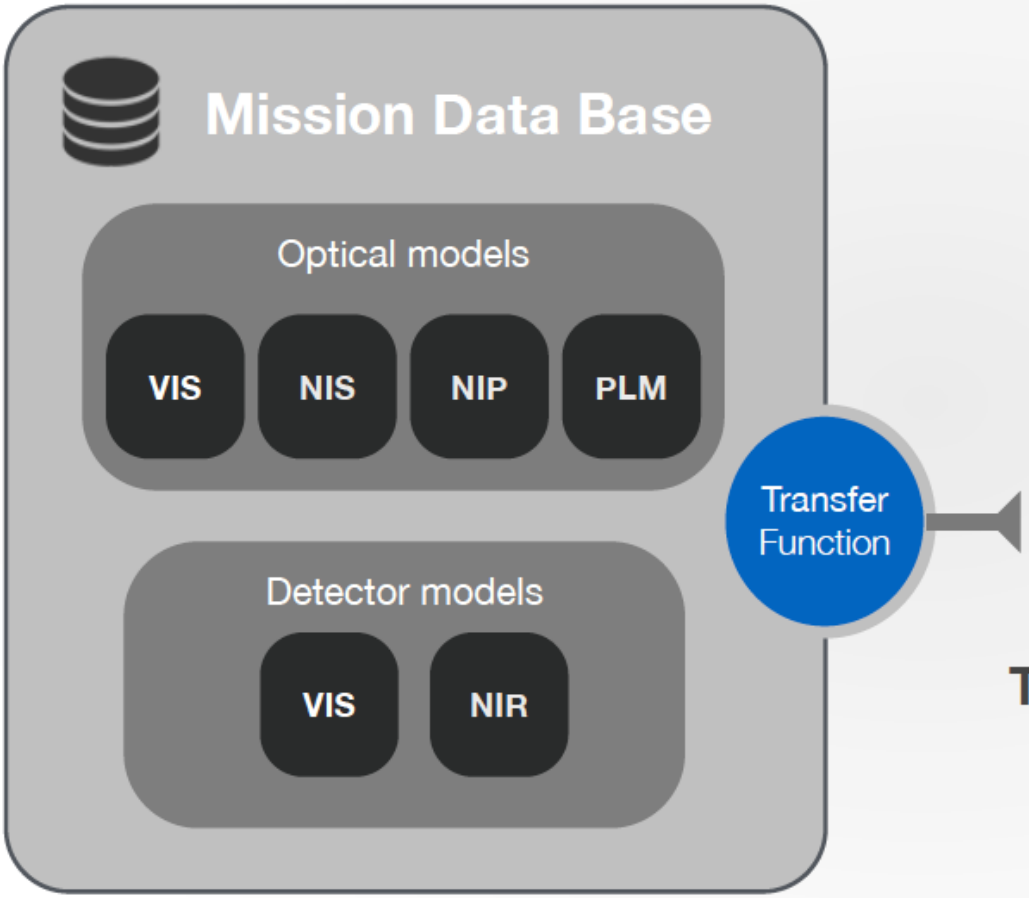
    H<29 complete: 1.23e+10 stars!
  - All sky **Trilegal** model simulation complete

Combined catalogue (Real bright + Modelled faint)

system overview OUSIM



MISSION + INSTRUMENT : the MDB



All instrument and telescope information parametrized in the **Mission Data Base**

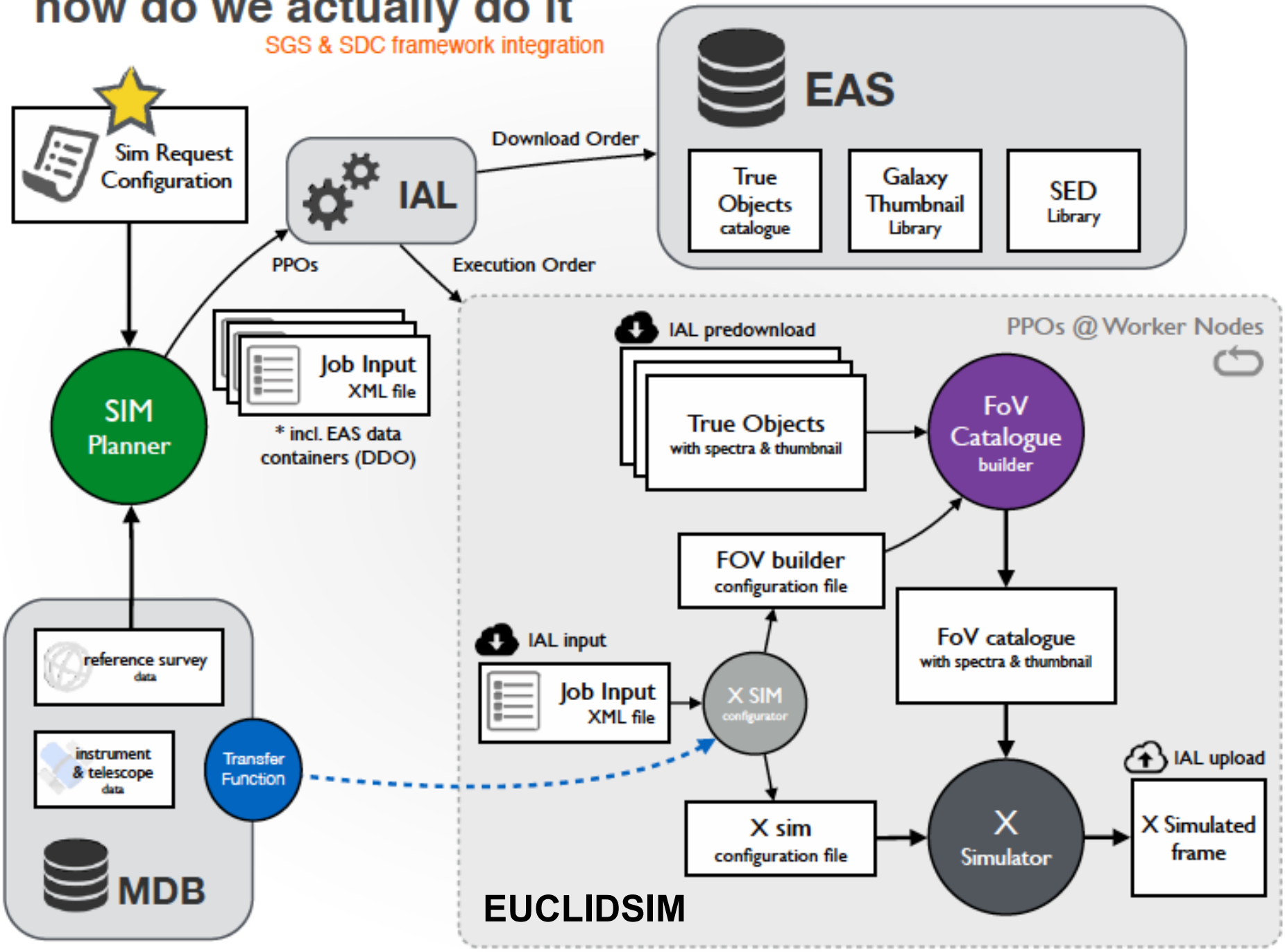
Multiple configuration sets:

- as Required
- as Designed
- as Simulated

Transfer Functions convert from Engineer to Scientific format

how do we actually do it

SGS & SDC framework integration



PF SIM pipeline prototype

- **THE SIM Request**
  - Prepare a scenario file from an user interface with different options
- **The SIMplanner**
  - Receive the simulation request (field or survey realization)
  - Build a scenario from the MDB and EAS informations
  - Send the observation scenario to EUCLIDSIM
- **EUCLIDSIM**
  - Build the sky FOV observation ('true information')
  - Build configuration files (one/simulator)
  - Send to the simulators and produce images

What can already be produced ?

-OUTPUTs images : VIS, NISP-P, NISP-S, PHZ, EXT-DES

-in configuration
-with enable/disable specific effects (CTI, cosmics….)

-Reference Euclid survey, EXT observations (DES)

-by position ra/dec
-by line of sight
-by date
-by field or number of field
-by type (wide/deep/cal/…)

-A True Universe

-Stellar catalog (i.e Besancon)
-Mock galaxy catalogs (i.e MICE and DURHAM)

- **An instrument model by the MDB**
  - Mission parameters file with one realization

SIM challenge : first production test

Euclid Consortium

(coordinate with the SGS challenge 4)

GOAL : *Produce a simulation set 10 deg^2 with full field for VIS, NISP-P, NISP-S + EXT-DES using a set of galaxies+stars and the SGS tools:*

Dead line : end 2014

- Reorganization and homogenization of 3 Euclid Simulators ✔
- Re write the configurators and wrappers ✔
- Integration of EXT-DES sims ✔
- Update the Data Model ✔
- Ensure configuration management rules ✔
- Common True Universe input and interface with SWG ✔
- Add stamps and spectra in progress
- Make use of MDB common repository & reference survey ✔
- Develop a Simulation Planner (integrated with IAL) ✔
- Deploy all together on SDCs in progress
- V&V plan. First implementation. ✖

SIMULATION
Production and development PLAN

FOLLOW OUs V&V plans

Need your requirements !!

			Level 1			Level EXT			Level 2										Level 3		
			VIS Raw Exposures	NISP-P Raw Exposures	NISP-S Raw Exposures	Ground Based Raw Images	Ground Based Catalogues	Gaia Catalogues	VIS Clean Exposures	NIR Clean Exposures	SIR 2D Spectra	VIS Single-Epoch detections	NIR Single-Epoch detections	SIR 1D Spectra	EXT Euclidized GB frames	EXT Simgle Epoch detections	Coadd VIS Frame	Coadd NIR Frame	Coadd EXT Frame	PHZ Catalogue	SPE Catalogue	SHE Catalogue
True Universe	Sources	True Galaxies	✔	✔	✔	✔	✔	✘	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
		Real Galaxies	✔	✔	✔	✔	✔	✘	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
		True Stars	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
		Galaxy Extinction	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
	Background	Zodiacal Light	✔	✔	✔	✔	✘	✘	S1	S1	S1	SPBE	SPBE	SPBE	SE	SE	SPBE	SPBE	SPBE	SPBE	SPBE	SPE
		Cosmic rays	✔	✔	✔	✔	✘	✘	S1	S1	S1	✘	✘	✘	SE	SE	✘	✘	✘	SPBE	SPBE	SPE
		Atmosphere	n/a	n/a	n/a	✔	✘	n/a	n/a	n/a	n/a	n/a	n/a	n/a	SE	SE	n/a	n/a	SPBE	SPBE	SPBE	SPE
		Moon	n/a	n/a	n/a	✔	✘	n/a	n/a	n/a	n/a	n/a	n/a	n/a	SE	SE	n/a	n/a	SPBE	SPBE	SPBE	SPE
Instrument		Readout Noise	✔	n/a	n/a	n/a	n/a	n/a	S1	n/a	n/a	✘	✘	✘	n/a	n/a	SPBE	n/a	n/a	SPBE	SPBE	SPE
		Bias	✔	n/a	n/a	n/a	n/a	n/a	SPBE	n/a	n/a	✘	✘	✘	n/a	n/a	✘	n/a	n/a	SPBE	SPBE	SPE
		Dark Current	✔	n/a	n/a	n/a	n/a	n/a	S1	n/a	n/a	✘	✘	✘	n/a	n/a	SPBE	n/a	n/a	SPBE	SPBE	SPE
		Crosstalk	✔	n/a	n/a	n/a	n/a	n/a	SPBE	n/a	n/a	✘	✘	✘	n/a	n/a	SPBE	n/a	n/a	SPBE	SPBE	SPE
		Cosmetics	✔	n/a	n/a	n/a	n/a	n/a	SPBE	n/a	n/a	✘	✘	✘	n/a	n/a	SPBE	n/a	n/a	SPBE	SPBE	SPE
		IPQE	✔	n/a	n/a	n/a	n/a	n/a	SPBE	n/a	n/a	✘	✘	✘	n/a	n/a	SPBE	n/a	n/a	SPBE	SPBE	SPE
		Var. Pixel Response (FF)	✔	n/a	n/a	n/a	n/a	n/a	SPBE	n/a	n/a	✘	✘	✘	n/a	n/a	SPBE	n/a	n/a	SPBE	SPBE	SPE

Simulation Releases

Development Plan

Pipeline Element	SR0	SR1	SR2	SR3	SR4	SR5	SR6	SR7	SR8	SR9	SR10	SR11	SR12
SIM Pipeline	0	1	1	2	2	3	3	3	3	3	3	3	3
SIM Validation	X	0	1	1	1	2	2	3	3	3	3	3	3
VIS Simulator	1	1	1	2	2	3	3	3	3	3	3	3	3
NISP-S Simulator	1	1	1	2	2	3	3	3	3	3	3	3	3
NISP-P Simulator	1	1	1	2	2	3	3	3	3	3	3	3	3
EXT DES Sim	X	0	1	1	1	2	2	3	3	3	3	3	3
EXT KIDS Sim	X	X	X	0	1	1	2	2	2	3	3	3	3
EXT HSC Sim	X	X	X	X	0	1	1	2	2	3	3	3	3
EXT Gaia Sim	X	X	0	1	1	2	2	3	3	3	3	3	3
MER Bypass Sim	X	X	X	0	1	1	2	2	2	3	3	3	3
SHE Bypass Sim	X	X	0	0	1	1	2	2	3	3	3	3	3
SPE Bypass Sim	X	0	0	1	1	1	2	2	3	3	3	3	3
PHZ Bypass Sim	X	0	1	1	1	2	2	2	2	3	3	3	3
LE3 Bypass Sim	X	0	1	1	1	2	2	2	2	3	3	3	3
True Univ. - Galaxies	X	0	1	1	1	2	2	3	3	3	3	3	3
True Univ. - Stars	0	1	1	2	2	2	3	3	3	3	3	3	3
Sim. Planner - Euclid	0	1	1	2	2	2	3	3	3	3	3	3	3
Sim. Planner - EXT	X	0	1	1	1	2	2	3	3	3	3	3	3

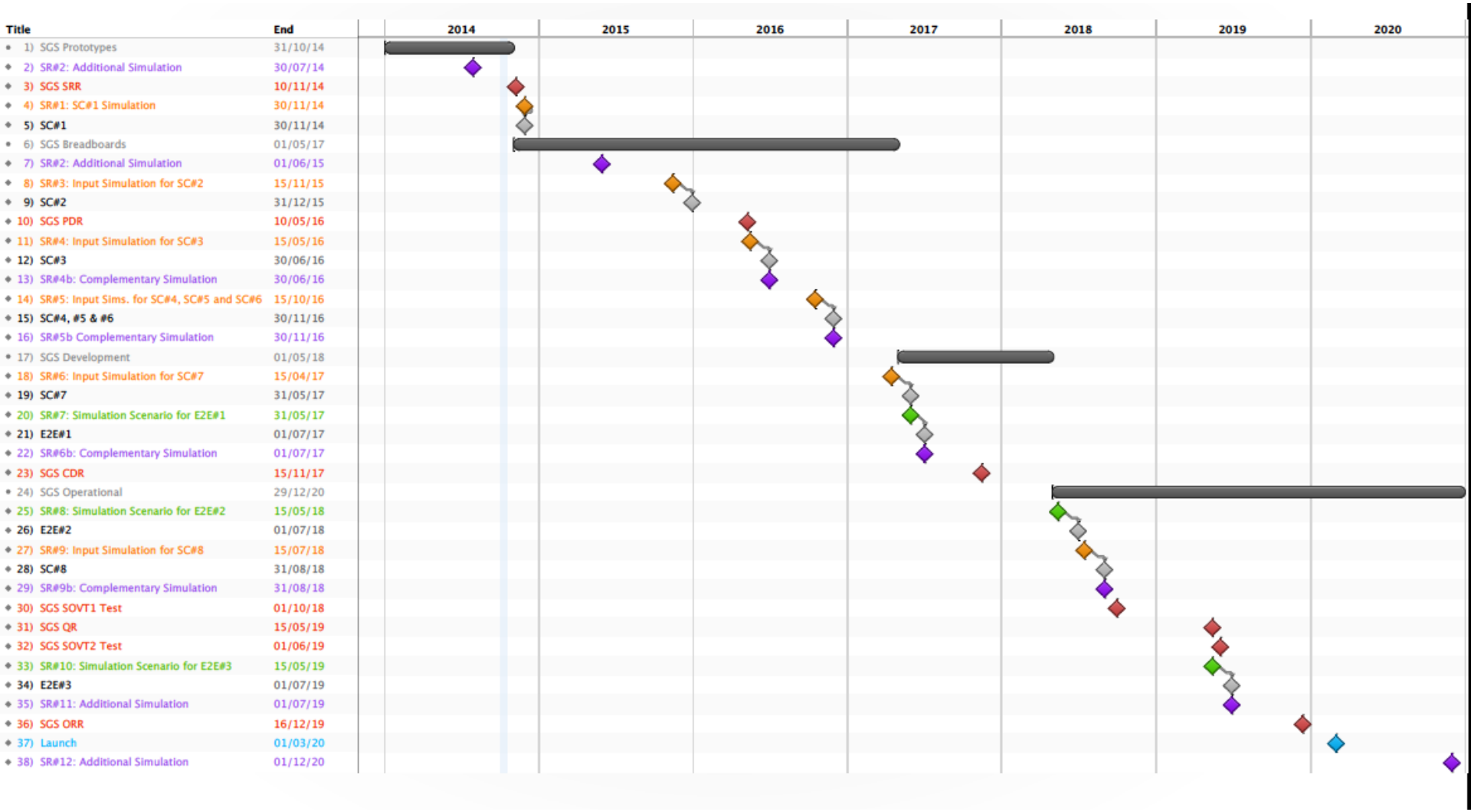
X N/A
0 **Design & modelling** [prototype]
1 **Development & integration**
2 **Validation, Verification & Optimization**
3 **Operation** [production]

RELEASES: PLAN and SCHEDULE

Simulation Release	Channels	Coverage	Due Date
SR#0: Challenge Preparation	VIS / NISP-S / NISP-P (Level 1)	~1 deg² (2 hours of observation)	30/07/2014
SR#1: SC#1 Simulation	Level 1 / EXT (DES)	~10 deg² (1 day of observation)	30/11/2014
SR#2: Additional Simulation	Level 1 / EXT / PHZ / LE3	~50 deg² imaging (Level Q size) ~500 deg² catalogues	01/06/2015
SR#3: Input Simulation for **SC#2**	Level 1	~100 deg² (1 week of observation)	15/11/2015
SR#4: Input Simulation for **SC#3**	VIS / NISP-P / EXT / MER	~100 deg² imaging ~500 deg² catalogues with different params and systematics (x5)	15/05/2016
SR#4b: Complementary Simulation	NISP-S / SHE / SPE / PHZ / LE3	Same as SR#4	30/06/2016
SR#5: Input Sims. for **SC#4, SC#5** and **SC#6**	SHE / PHZ / SPE	1 deep field ~500 deg² imaging ~2000 deg² catalogues	15/10/2016
SR#5b Complementary Simulation	Level 1 / EXT / LE3	Same as SR#5	30/11/2016

PLANNING

Euclid Consortium



Production plan : OUSIM Policy

SGS Scientific Challenges Simulations
Scheduled by SGS IV&V group
SGS integration & validation
M-L size

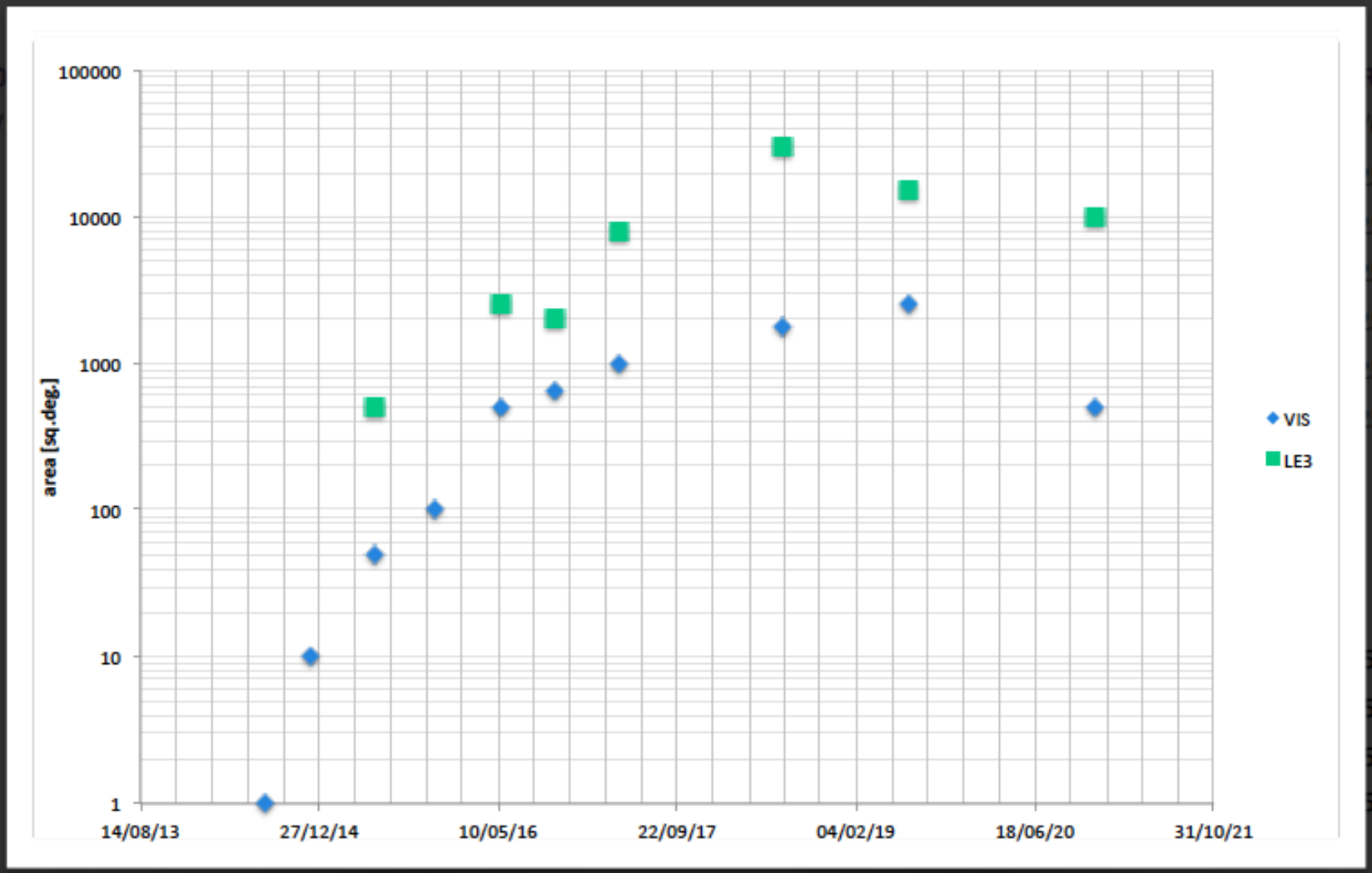
OU Additional & Complementary Simulations
Scheduled by OUSIM (based on OU needs)
OU Algorithm testing and validation
M size

End to End Scenario Simulations
Scheduled by E2E group
Performance evaluation
M-XL size

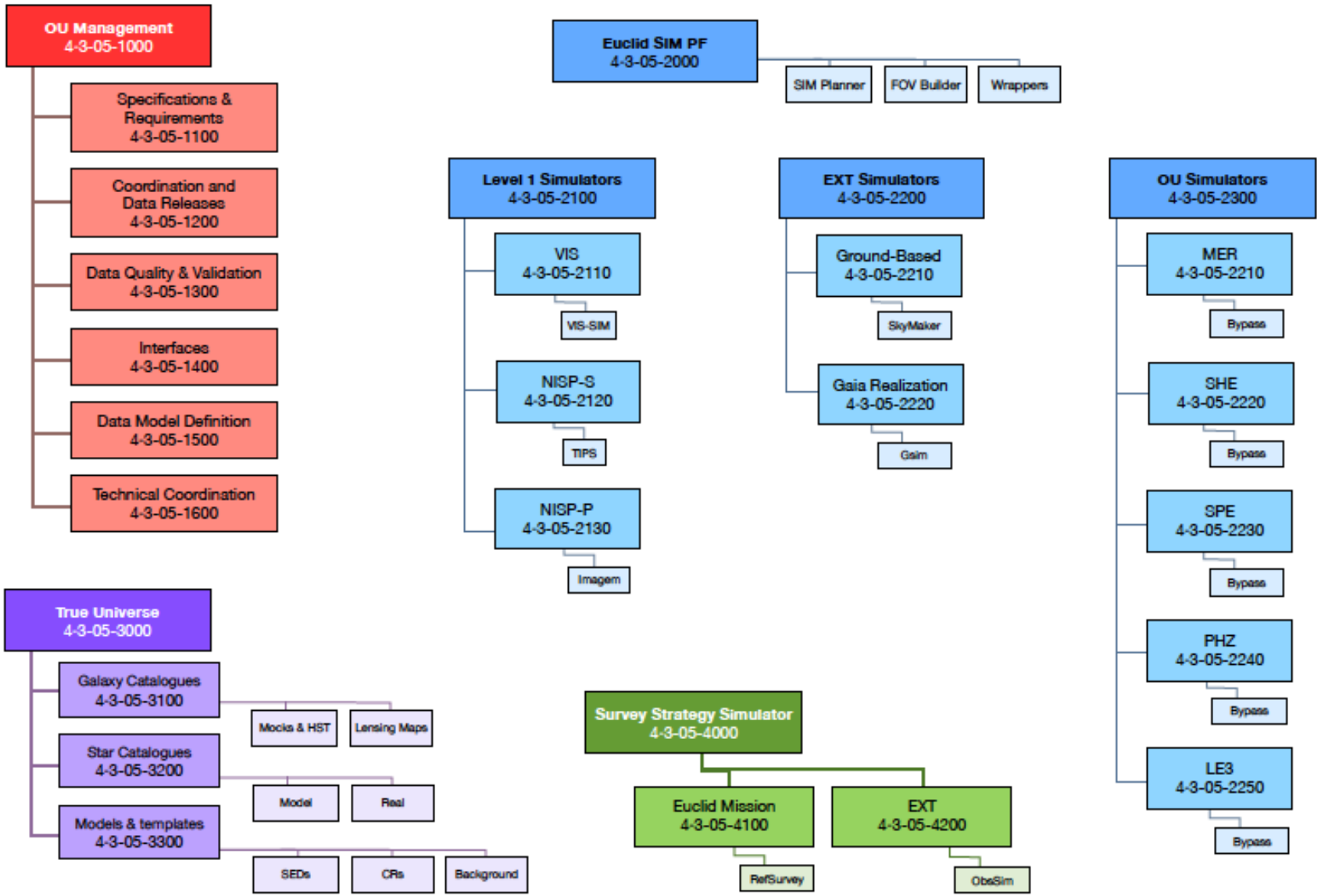
Unofficial Simulations
Not scheduled. Produced ad-hoc by any euclid member.
Any test off the record
S size

Production plan

Euclid Consortium



Evolution of the simulated area at pixel level (VIS) and catalogue level (LE3)



Simulated area coverage at pixel level (VIS) and catalogue level (LE3) by Simulation Release

THE TEAM

Euclid Consortium

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Conclusion

OUSIM prepares a pipeline tool to support :

-production of large simulation of Euclid images

-compatibility with multi parameters scenarios

-A SIM pipeline prototype is almost ready and under configuration

- First production soon !!!