



Euclid Archive Science Archive System

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Euclid Archive System Overview

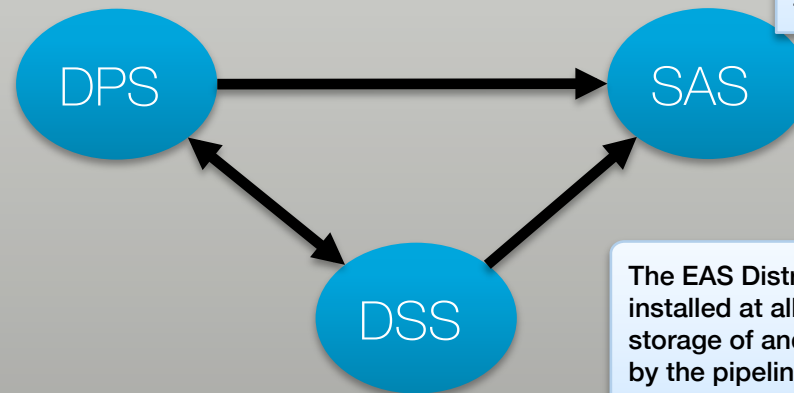


Euclid Archive System

The EAS Data Processing System (DPS) stores the data products metadata including the locations of the data files.

It provides access to the data products to the EC members, including processing coordination, quality control and processing history tools.

The EAS Science Archive System (SAS) provides access to the Euclid data focused on the scientific use of the data.



The EAS Distributed Storage System (DSS) is installed at all SDCs & SOC and manages the storage of and access to the data files generated by the pipelines.

Storage systems are provided by all the SDCs & SOC. All public data will be located at ESAC.

Storage infrastructure located at SDCs/SOC

SGS presentation (M. Sauvage)

EAS-SAS Overview



EAS-SAS @ESDC

The SAS is being built at the ESAC Science Data Centre (ESDC), which is responsible for the development and operations of the scientific archives for the Astronomy & Solar System missions of ESA.

Science Community

The SAS is focused on the needs of the scientific community and it will provide access to the most valuable scientific metadata from the EAS-DPS.

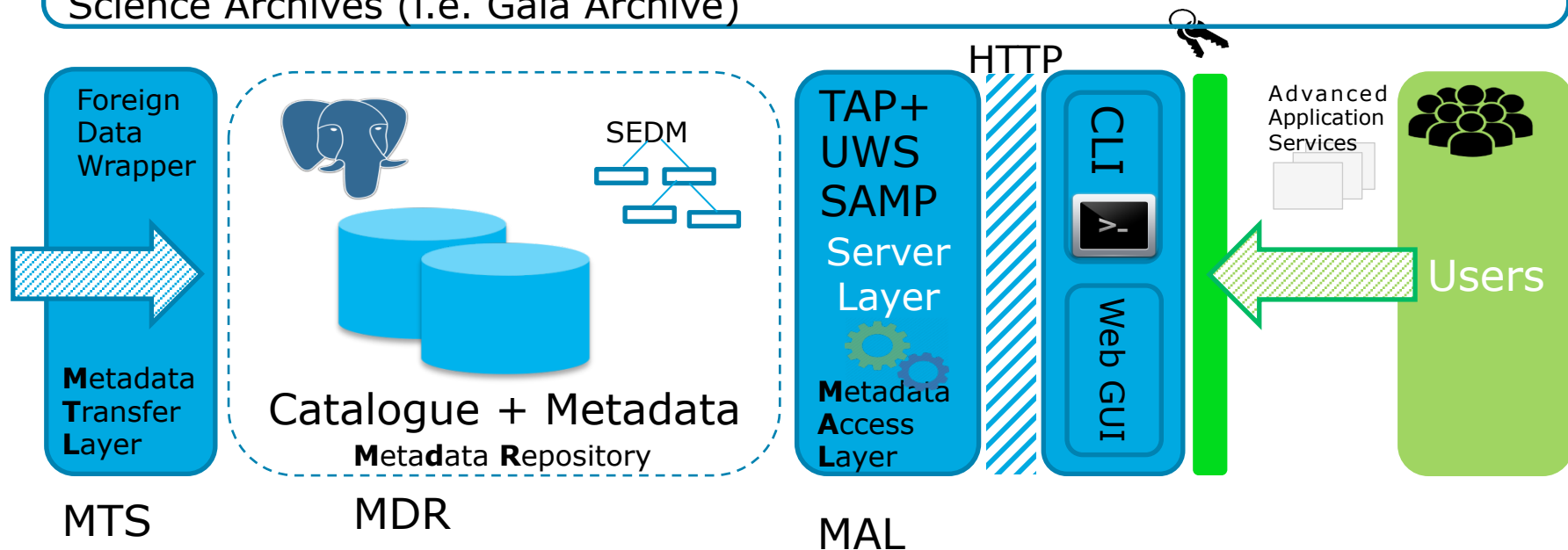
Main Capabilities

- Parametric search for Euclid scientific metadata and catalogues
- Visualization and exploration of images, spectra and catalogues
- Upload, cross-match and sharing capabilities with scientific community

SAS Architecture



SAS builds on top of the latest ESDC's common Archives Building System Infrastructure, which defines the common components to the latest ESA Science Archives (i.e. Gaia Archive)



EAS-SAS Technology



- SAS backend is based on **Java**
- SAS Web portal is based on **Google Web Toolkit** (JavaScript)
- SAS database is based on **PostgreSQL** and accessed through **TAP+ Interface**



- Modules **pgSphere** and **Q3C** provide spherical data types, functions and operators
- to PostgreSQL



- SAS provides **VO Interfaces (IVOA)**



- SAS access relies on **ESA LDAP** and CAS service for A&A control

EAS-SAS: Metadata Repository (MDR)



Catalogues available at Metadata Repository

- KiDS Catalogue (~16 millions sources)
- True Universe Sources Catalogue (~355.000 sources)
- 3XMM-DR5 Catalogue (~556.000 sources)
- SC#2 NIR and VIS catalogues

MDR Environment

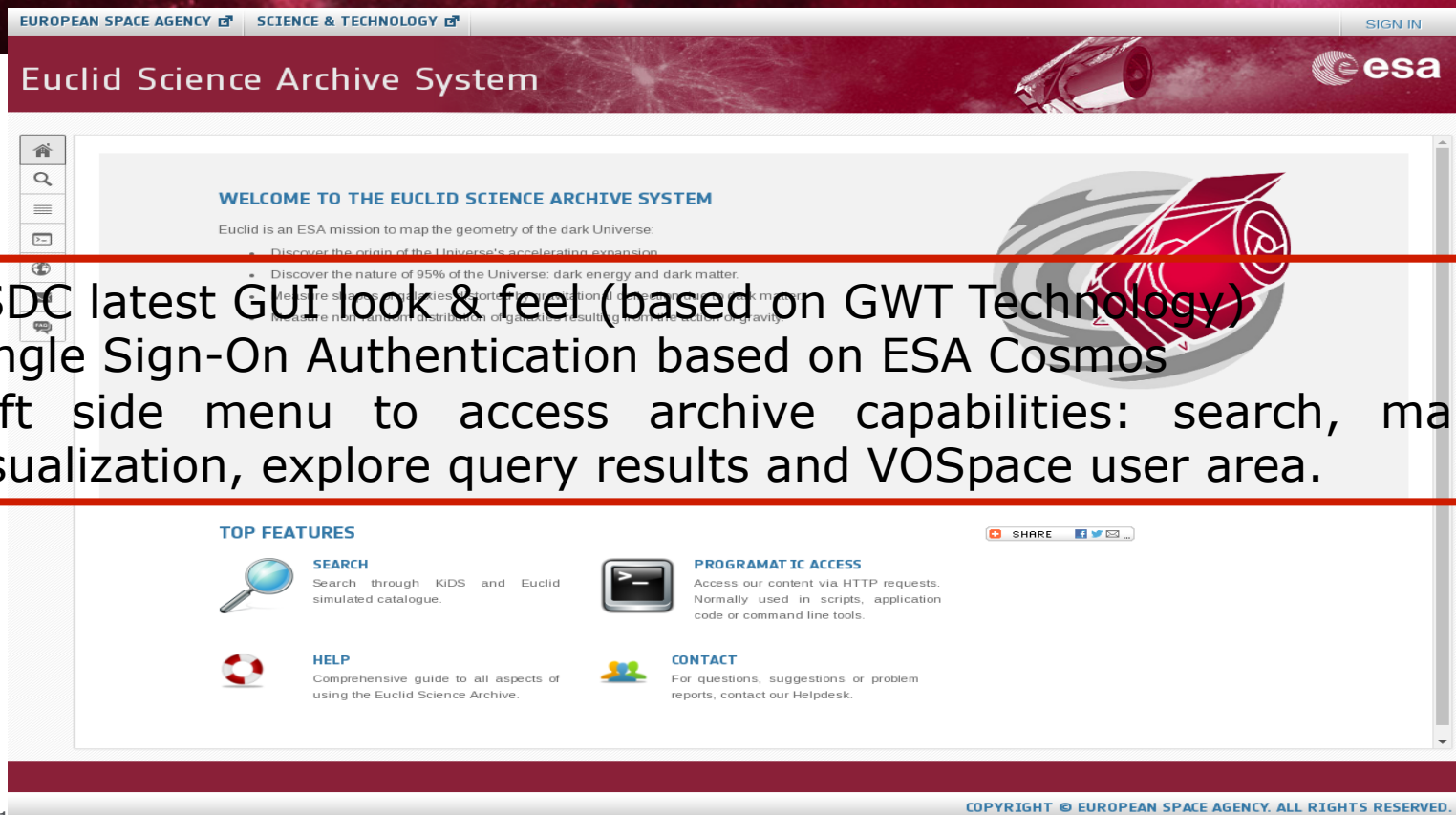
- PostgreSQL+ PgSphere + Q3C
- Development (PostgreSQL 9.4.4)
- Shared DB Server with 128GB RAM (shared with DPS-MDR)



Other database technologies can be considered according to the requirements (metadata volumes).

SAS Prototype: Home landing page

<http://eas.esac.esa.int/sas-dev/>



- ESDC latest GUI look & feel (based on GWT Technology)
- Single Sign-On Authentication based on ESA Cosmos
- Left side menu to access archive capabilities: search, maps visualization, explore query results and VOSpace user area.

SAS Prototype: L2 Maps visualization



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Euclid Science Archive System

J2000 13 32 36.210 +47 25 30.60

Sky:KIDS

Select sky

Submillimetre Skies Colour map

Herschel SPIRE RGB (250+350+500)

FoV: 59.95

Space Agency

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- Visual exploration capabilities for Euclid images (in progress)
- Visualization of Euclid simulated maps
- Based on ESASky technologies (CDS Aladin Lite)
- Map selector and search target capabilities
- Future tools to work online: spectra tools, catalogues overlay, etc.

SAS Prototype: Metadata Parametric Search



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Euclid Science Archive System

Shows the Euclid simulated catalogues.

```
1 select * from kids_mb_catalogue where kids_mb_catalogue_oid < 10
```

Submit Clear

Output format: csv, vtable, json, csv

Status	Job	Creation date	Num. rows	Size	
✓	146339530561D	16-May-2016, 10:45:34	0	0 KB	
✗	1463734001159D	20-May-2016, 10:46:41	0	0 KB	
✗	14633395332561D	16-May-2016, 12:42:12	9	10 KB	
✗	1463395305397D	16-May-2016, 12:41:45	0	0 KB	
✗	1463395304583D	16-May-2016, 12:41:44	0	0 KB	
✓	1462371448203D	04-May-2016, 16:17:28	4	9 KB	
✓	1460628047629D	14-Apr-2016, 12:00:47	19	23 KB	
✓	1459937769406D	06-Apr-2016, 12:16:09	4	9 KB	
✓	1459888982078D	05-Apr-2016, 22:43:02	4	9 KB	
✓	1459847049776D	05-Apr-2016, 11:04:09	4	9 KB	
✓	1456924920315D	02-Mar-2016, 14:22:00	9	10 KB	

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Select all jobs Delete selected jobs

Space Agency

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SAS Prototype: Query results visualization



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Euclid Science Archive System

RESULTS Close All Search #2

a	b	class_star	decj2000	ellipticity	flag_g	flag_i	flag_r	flag_u	flux_a
28.361213684082	19.5580997467041	0.028626730665564537	0.0234802702118011	0.31039274	0	0	0	2	1.8226
18.028284072876	16.1433486938477	0.8454134464263916	0.0335010643494903	0.104554355	71	71	71	2	
31.5082187652588	19.0718555450439	0.800537109375	-1.94753313909142	0.3947022	95	95	95	3	
13.4543380737305	11.7804107666016	0.8599305152893066	-1.96084700568871	0.12441546	78	78	78	2	
11.853874206543	9.76762008666992	0.9851921796798706	0.0146565120193743	0.17599767	70	70	70	0	
16.5275421142578	14.6642255783081	0.8454148769378662	0.0281601759871827	0.1127401	70	199	70	0	
13.6611490249634	11.8523035049438	0.9828934073448181	0.023554778750443	0.13240802	78	78	78	2	
12.9753398895264	11.1105194091797	0.9799886345863342	0.0177497950121984	0.14372033	198	66	70	0	
10.3502311706543	8.24761009216309	0.9992848634719849	0.0146747184199141	0.20314723	0	66	128	2	2.854
10.3807506561279	8.94299030303955	0.9859921336174011	0.0155503135781556	0.13850254	0	66	66	0	5.149
9.66771411895752	7.97444581985474	0.9539980292320251	0.0150351250943199	0.1751467	0	66	0	2	2.7156
10.9173917770386	8.45526599884033	0.9988491535186768	0.0157543552602395	0.22552323	0	66	0	3	5.2366

1-19 of 19 Show query in ADQL form

Online results inspection (for a reduced set of results)

SAS Prototype: VOspace Sharing capabilities



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Euclid Science Archive System

Shows the Euclid simulated catalogues.

- Sharing capabilities through VOSpace Browser
- Sharing scientific results with scientific community
- Available for LDAP users

Output format: csv

EAS-SAS send to VOSpace

Job ID: 1463734056137D

Destination folder: /snieto/EAS/

File name: 1463734056137D.

☒ Overwrite file

					Size	
1463734056137D					10 KB	
1463734000018D						
1463395332561D		16-May-2016, 12:42:12	9	10 KB		
1463395305397D		16-May-2016, 12:41:45	0			
1463395304583D		16-May-2016, 12:41:44	0			
1462371448203D		04-May-2016, 16:17:28	4	9 KB		
1460628047629D		14-Apr-2016, 12:00:47	19	23 KB		
1459937769406D		06-Apr-2016, 12:16:09	4	9 KB		

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Select all jobs Delete selected jobs

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- Sharing capabilities through VOSpace Browser
- IVOA protocol for distributed storage
- Single Sign-on based on ESA Cosmos Authentication (LDAP)
- RESTful API for: upload, download, share, etc.

SAS Current Status

<http://eas.esac.esa.int/sas-dev/>



SAS features up-to-date:

- **Parametric Search** through TAP+ interface (ADQL language)
- **Query execution management** through UWS protocol
- **"Euclid Sky"**: HiPS Maps Visualization interface
- **Online results inspection**: subset of query results
- **VOspace** user storage area connected to SAS
- **A&A mechanism** based on *ESA Cosmos CAS* (LDAP)

VO Protocols already in SAS:

- **TAP+** (Gaia extension) for parametric search
- **UWS** used by TAP+ for managing requests
- **VOspace** to preserve and share query results with the ESA Community
- Next, SAMP integration.

Which data in SAS for legacy ?



- Level 1 (?)
- **Level2 : VIS & NIP co-added maps** (4 dithers) and also individual exposures.
 - + Weight + Flag (mask), Noise maps
 - (OU-SIR) NIS level 2 ?
- (OU-MER) source catalogues
- (OU-PHZ) photometric redshifts (PDFs)
- (OU-SPE) NIS spectra
- Ground-based imaging supporting the Euclid survey: DES, KiDS, CFIS (u, r), CEFC/JST (g-band), LSST (?)
- OU-LE3 products: shear maps, galaxy clustering, galaxy clusters
- Other legacy products ? For instance :
 - Strong lensing: 10^5 gravitational arcs (cluster and galaxy lensing)
 - Solar system objects: few $\times 10^5$ (few to hundreds per Euclid field)

SAS for legacy



- Imaging
 - Cut-out service mandatory
- Catalogues
 - relatively easy to ingest
 - with interactive overlay capabilities
 - photometry (aperture, PSF fitting, Kron, Petrosian ..., morphology)
 - Federated catalogues, eg. e-ROSITA
- Command line interface
 - Processing environment close to the data

EAS-SAS roadmap



➤ Euclid Archive Users Group (EAUG)

- User Stories
- Use cases
- User Requirements

➤ More active members in EAUG welcome !

EAS Use Cases

EAS Use Case should be described following [ST template for Use Cases](#)

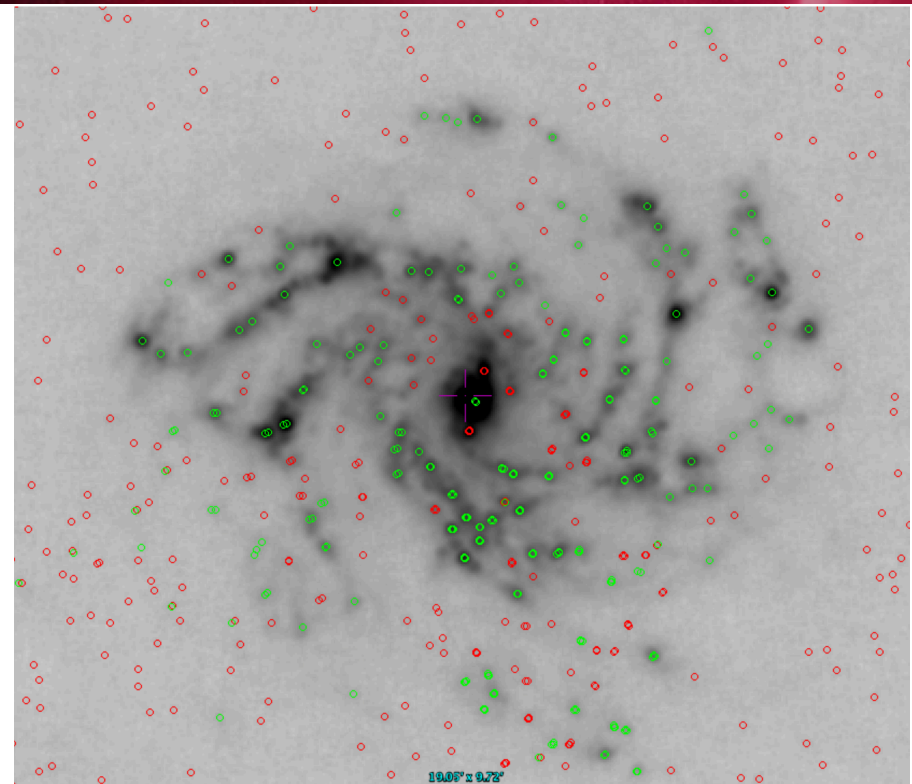
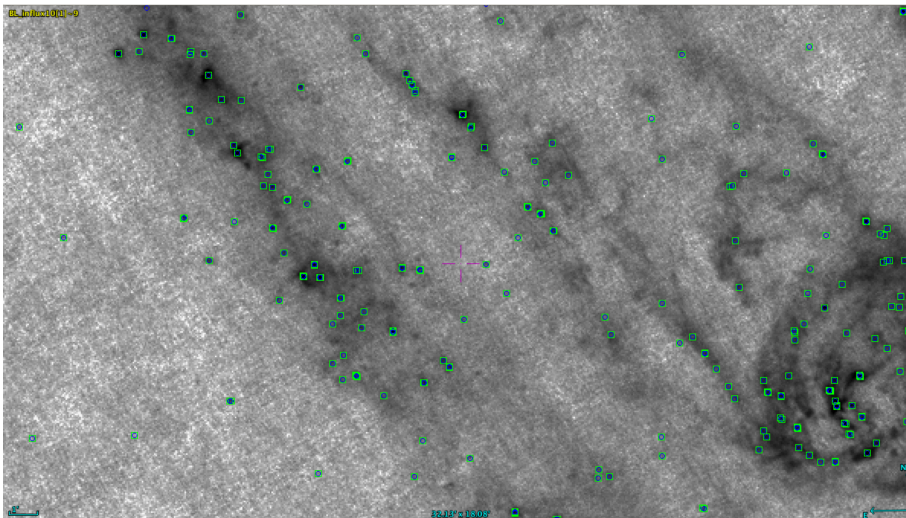
Use Case Number	Use Case	Origin	Subsystem	Operational Priority	EAS Release
EUC-SGS-EAS-0001	EAS-DPS Metadata – Automatically Generated Metadata	EAUG	EAS-DPS	Medium	1.0
EUC-SGS-EAS-0002	EAS-DPS Metadata – Metadata Parametric Search	EAUG	EAS-DPS, EAS-DSS	High	0.3
EUC-SGS-EAS-1002	EAS-SAS Metadata – Metadata Parametric Search	EAUG	EAS-SAS	High	0.3
EUC-SGS-EAS-0003	EAS-DPS Metadata – Metadata Parametric Search with Association	EAUG	EAS-DPS	High	0.5
EUC-SGS-EAS-1003	EAS-SAS Metadata – Metadata Parametric Search with Association	EAUG	EAS-SAS	High	0.5
EUC-SGS-EAS-0004	EAS-DPS Metadata – Metadata Parametric Search with Loop and User Interaction	EAUG	EAS-DPS	High	0.5
EUC-SGS-EAS-1004	EAS-SAS Metadata – Metadata Parametric Search with Loop and User Interaction	EAUG	EAS-SAS	High	0.5
EUC-SGS-EAS-0005	EAS-DPS Metadata/Data – Metadata Parametric Search with Visualization and User Interaction	EAUG	EAS-DPS, EAS-DSS	High	0.6
EUC-SGS-EAS-1005	EAS-SAS Metadata/Data – Metadata Parametric Search with Visualization and User Interaction	EAUG	EAS-SAS	High	0.6
EUC-SGS-EAS-0006	EAS-DPS Metadata – Metadata Parametric Search with Ingest of User-Defined Catalog and Association and Visualization	EAUG	EAS-DPS	Medium	1.0

Photometry of large galaxies ?



NGC1365

Herschel Point-source catalogue



SAS vision



- Concept: re-use of ESDC expertise
 - ESASky for the sky exploration
 - GAIA archive for catalogue querying
 - similar to CasJobs /SciServer
 - *eHST archive for spectra*

- Primary goal of SAS is to support legacy science