Euclid/Gaia VO Protocols, Status and Evolution

Sara Nieto - Euclid Mission Technical Interface

P. Perez, P. Teodoro, J. Oliveira, J. Prados, J. Fernandez, C. Rios, V. Olmedo, M. Lopez, T. Alonso, J. de Bruijne, P. Ferruit, B. Altieri, R. Bhatawdekar, B. Merin, C. Arviset

IVOA Interop. @ Sydney

20/05/2024

Outline

- Euclid Overall picture
- Data releases and Multi-environment architecture
- Multi-environment Interoperability
- Shift to Direct Download Strategy
- Datalink
  - Datalink for Euclid
  - DataLink Evolution for Gaia DR#4
- Scientific Platform Interoperability

EC Internal Euclid release v1.1.0

- Euclid is performing the survey in 1 optical, 3 NIR bands and NIR spectroscopy.
- EC Internal Operational release of SAS v1.1.0 last March.
    - 50TB of data downloaded so far; ~77K ADQL Requests; ~50k Retrieval Requests
- Next Public Releases:
    - 2nd EROs release on 23rd of May through ESASky
    - DR#1 2026; DR#2 2028; DR#3 2031

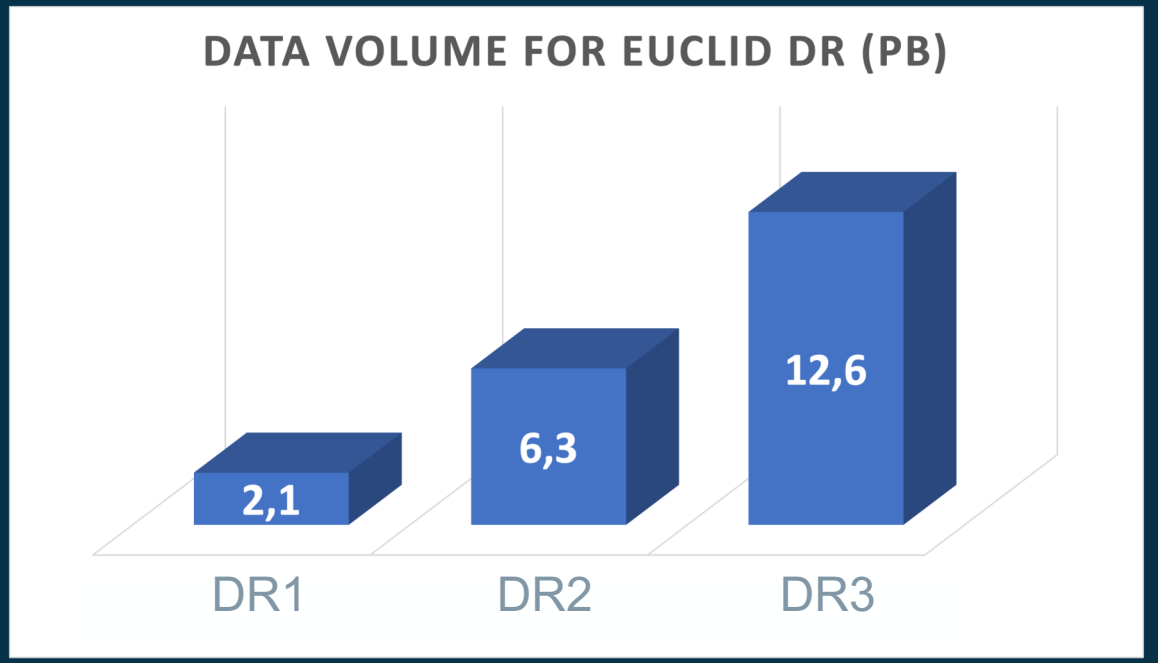
- Full list of data products to be released is under discussion:
    - Catalogues (MER, PHZ, SPE, SIR…)
    - Images: VIS and NIR Calibrated, Stacked and Mosaic, plus auxiliary products.
    - Spectra data.
    - LE#3 data products.
    - HiPS maps will be generated by ESDC HiPS pipeline using HiPS Gen by CDS.

Data Release and Bandwidth

DB and Bulk File system volumes on Dell Isilon:

- **Euclid DR1-3 expected growth of ~21PB by DR3**

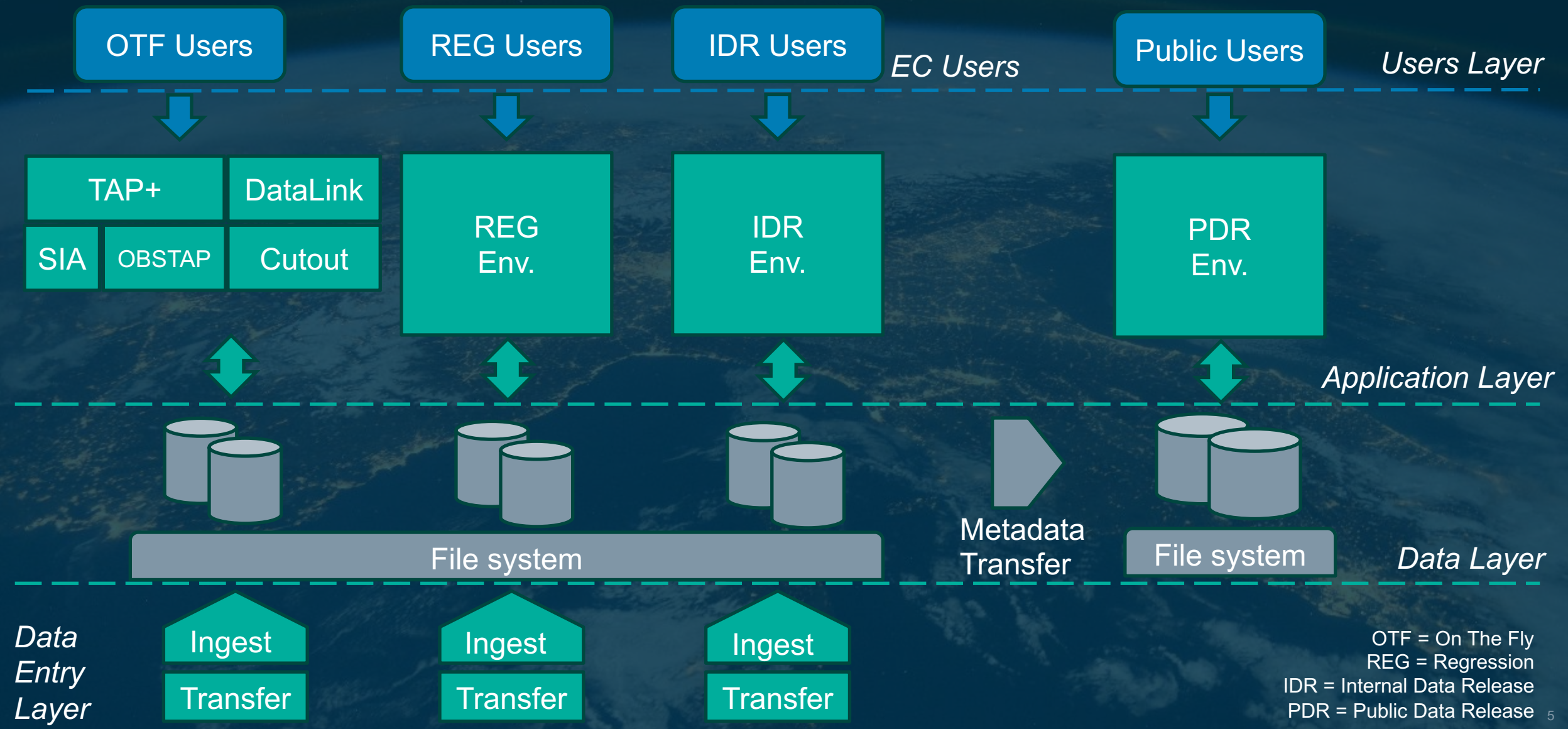
- **Inbound bandwidth 3 - 20TB/day**



Data Release	Observations	Area covered
DR1	2474	1336 square degrees
DR2	8104	4376 square degrees
DR3	16207	8752 square degrees

	Internal DR1	DR1	Internal DR2	DR2	Internal DR3	DR3
Date	APR25	FEB26	MAR27	FEB28	FEB30	FEB31
Data volume	2.1PB	2.1PB	6.3PB	6.3PB	12.6PB	12.6PB
SAS peak storage capacity	~7PB	~14PB	~17PB	~18PB	~32PB	~21PB
Access	EC only	Public	EC only	Public	EC only	Public

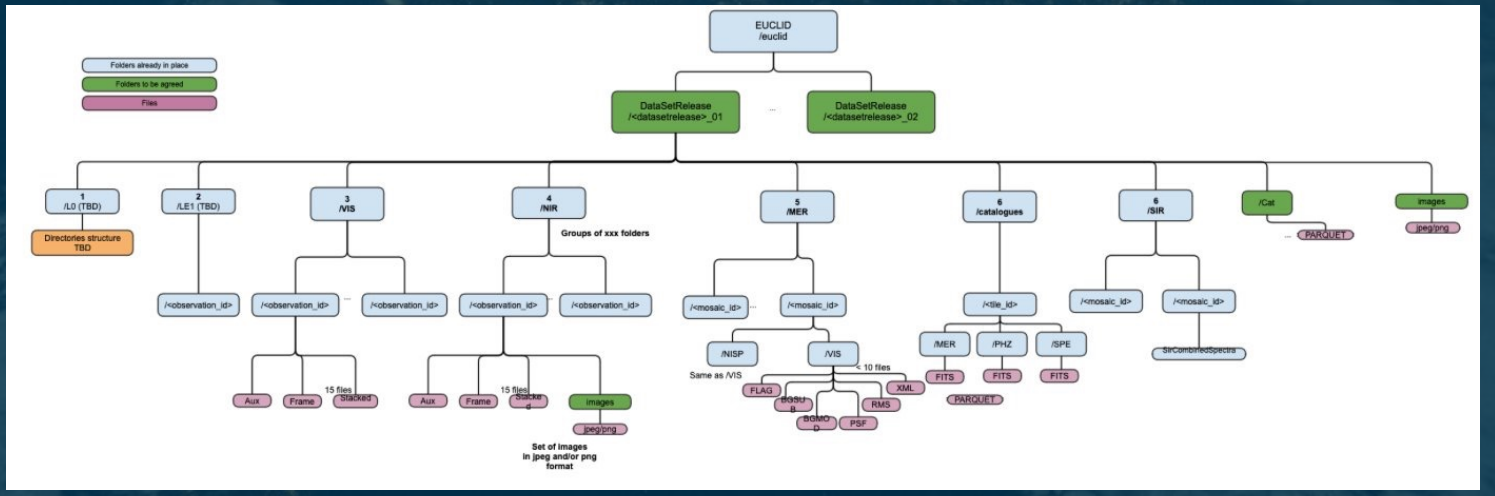
Multi-Environment Architecture



OTF = On The Fly
REG = Regression
IDR = Internal Data Release
PDR = Public Data Release

Multi-environment Interoperability

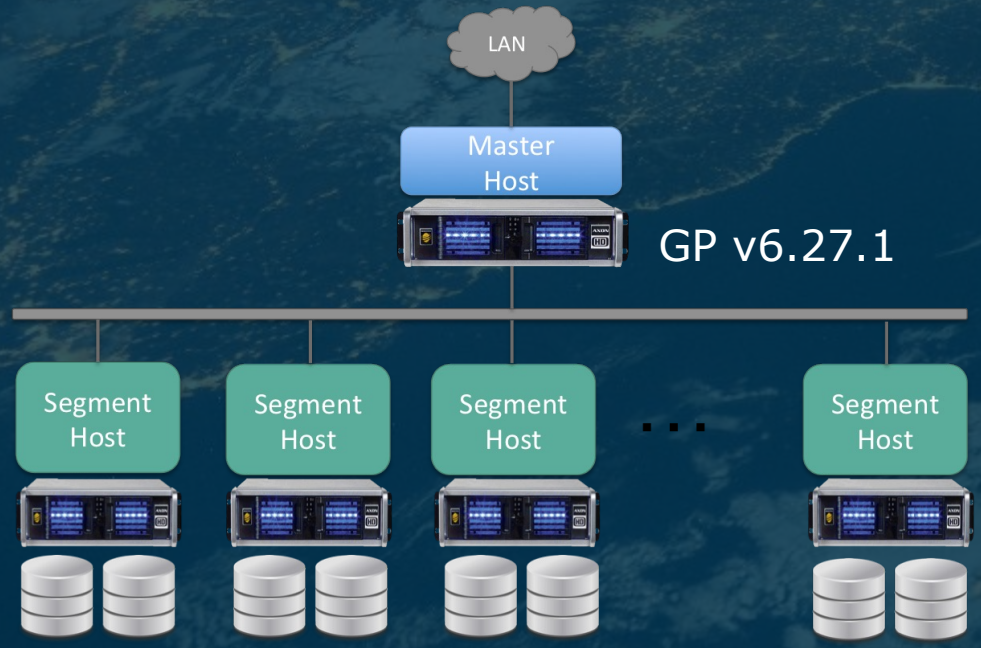
- Scalability: Need a stateless TAP+ service to handle sessions, quotas and UWS identifiers in a staless way.
- Multi-environment rational:
  - Independent data sets to be used by Euclid Consortium.
  - Different publication requirements per environment (e.g. removal and clean-up policy needed).
  - Avoid data and metadata duplication between environments (FS organization).
- Drawbacks of handling a multi-environment metadata access through multiple TAP+ services:
  - User's accounts cannot cross-correlate data between environments.
  - Handling and monitoring multiple services/environments, no load balancing and high availability.
- File system (NFS)
  - Is shared across environments.
  - Data Governance is common and Implemented at FS level.

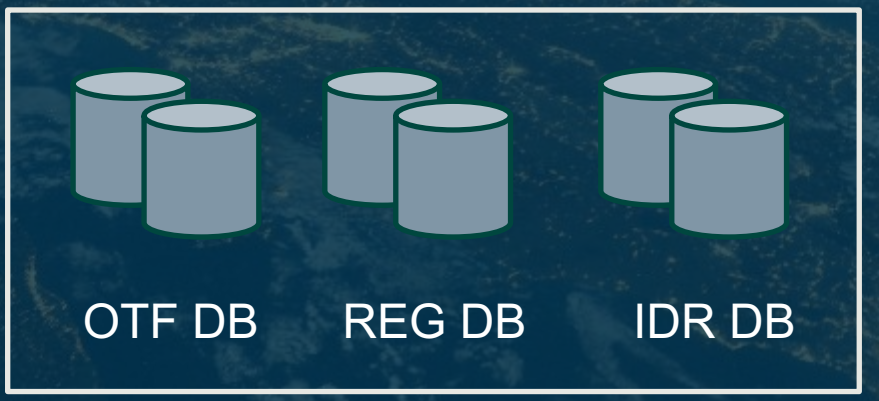


Multi-environment Interoperability – DB level

Challenges and next steps:

- Mission requirement: Row level authorization is required by Euclid TAP service.
- Group Membership Service (VO GMS) – ESDC TAP row level authorization
- Horizontal scaling: TAP+ and Datalink stateless.
- DB Share of Greenplum (GP) MPP resources.





Shift to Single File Download Strategy

- Problem at hand: traditional retrieval strategy of **bundling files does not scale**.
  - Files needs to be grouped/compressed (performance issues)
  - Internal quotas issues
  - Internal filesystem issues (size of volumes, security…)
  - That is even more crucial for big data missions

- Proposed solution: strategy based on **single file granularity**.
  - If more than one file is requested, a file with a list of direct links will be returned.
  - Advantages:
    - No intermediate ‘compressed’ file step. Generate 1-million line text file, not 1 million file zip.
    - Huge performance in result product generation
    - No disk space issues
    - No security issues
  - Disadvantages: The client needs to use an extra step to get the data.

Datalink and Data Access

- Euclid will serve 97% of the Data Releases through Datalink protocol.
- Datalink currently enables access to 1D Spectra based on catalogue Source Id.
- Datalink will provide access to:
  - MER mosaics/tiles and L2 Observations. Other aux files through recursive DL access.
  - Some LE#3 data products. To be generated by the second half of 2024.
  - VO Ad-hoc services: Images, cutout, etc.
- Single Datalink client in GWT to handle requests within the archive's GUI.
- Direct Data Access: GET and POST actions
  - *https://eas<env>.esac.esa.int/sas-dd/download?&format=ASCII_CURL&product_id=<product_id_list>*

- Single File Download URL will be included as another row in the Datalink response (as in spec.)

Gaia DR4 – Datalink Evolution

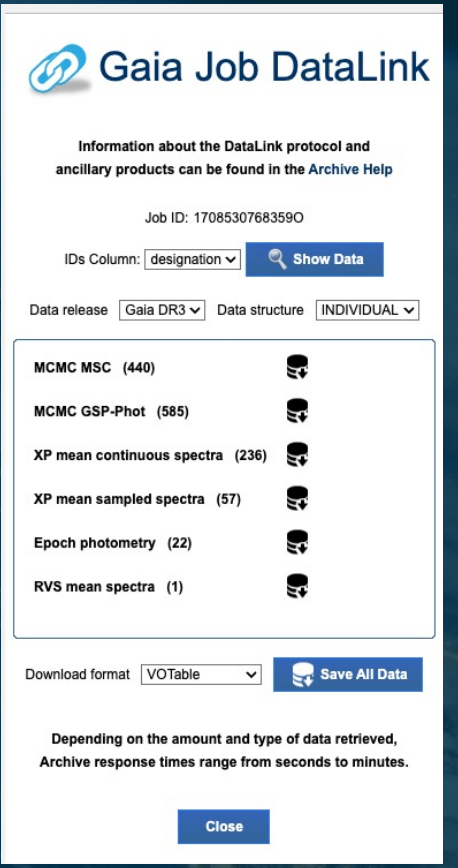
- **Gaia DR#4 is expected by 0.5 PB by end of 2025.**
- DR#4 will be made available through TAP and Datalink VO services.

- Strategy shift
  - Current DL strategy is based on DB storage.
  - From pure DB strategy to File base.

- Goal: How to enable exploitation of 0.5 PB data towards Datalabs?

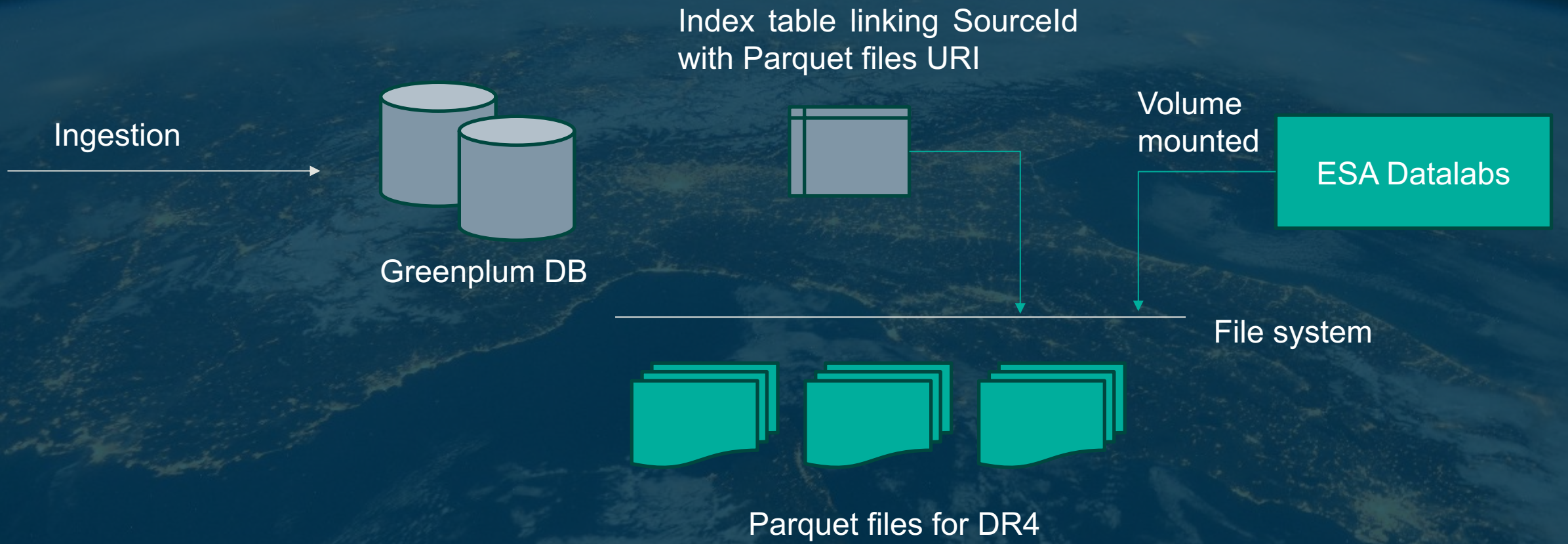
- Apache Parquet strategy, designed for efficient storage and fast reads.

- Status: Finishing the Datalink PoC



Gaia DR4 – Datalink Implementation Evolution

- A table with the DB index will be generated at Ingestion time.



All data for DL will be served from Parquet files, including what exists now on the DL databases so we use a single technology to serve DL products.

Scientific Platform Interoperability

- Some thoughts and questions…
  - Enable users to acess data products from the VO perspective in a Scientific Platform
    - Currently we provide the users with the paths were the data products are located
    - How other Scientific Platforms interoperate with the Archives in this regard?
    - What is the role of VOSpace in this regard?
  - In case of having an hybrid architecture approach (off-prem and on-prem storage)
    - Local path (NFS access)
    - Scientific platform access (S3+ Authorization layer)
  - Discoverability of services and Data Collections for Scientific Platforms

Thanks for your attention!