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Centro Nazionale di Ricerca in HPC,
Big Data and Quantum Computing

From Specification to Implementation: Latest Developments in Services and Archive Interfaces

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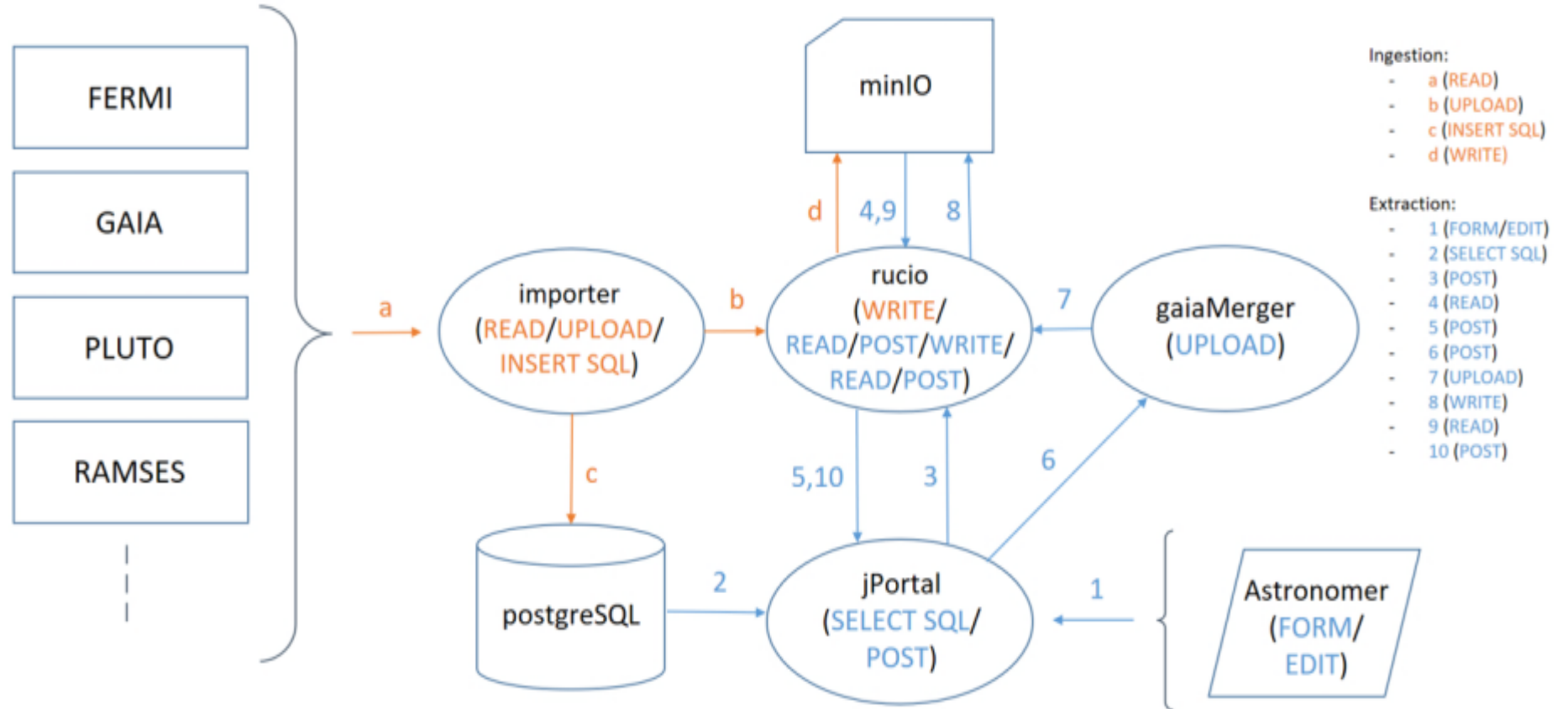
Spoke 3 II Technical Workshop, Bologna Dec 17 -19, 2024

Where were we?

- **The project focuses on developing effective data management solutions**
- **A framework specifically designed to address big data challenges in astrophysics, requiring customized data models and management strategies**
- **A custom web application developed to provide a user-friendly interface for accessing and querying archived metadata**
- **This presentation offers an update on the project's latest advancements, the introduction of new services and enhancements in archive interfaces**

New Actors / Actions Schema

The new actor “**gaiaMerger**” enables users to generate HDF5 files containing only the selected sources or transits extracted from the Gaia catalogs, resulting in more compact data files compared to the originals.



Galzignano's use cases

- **IDENTIFY ALL SOURCES WITH ALL TRANSITS**
- **Direction: Alpha (RA), Delta (Dec) + Arc width (epsilon)**
- **Range: Min/Max Alpha (RA), Delta (Dec)**
- **Time interval: transit date range**
- **COPY/PASTE a pre-built query using the integrated editor**

Results window

An example of a query result: one or more sources, transits or both, can be selected to be “Cut & Merged” by the gaiaMerger service.

jPortal

- Help
- Settings
- Observation
 - Fermi
 - Gaia
- Simulation
 - Pluto
 - Ramses

Resolve Edit Search Results Cut & Merge Reset

Sources

| <input type="checkbox"/> | file_name | source_id | alpha | alpha_star_error | delta |
|--------------------------|--|---------------------|--------------------|---------------------|--------------------|
| <input type="checkbox"/> | CompleteSource_130097_0003 | 3425114617586286848 | 1.618320372472243 | 0.0252838789312494 | 0.40193937806911 |
| <input type="checkbox"/> | CompleteSource_130097_0003 | 3425114617586288128 | 1.6182774194347807 | 0.08808795660406121 | 0.4018892840683867 |
| <input type="checkbox"/> | CompleteSource_130097_0003 | 3425114617587515008 | 1.6182973429850582 | 2.864232984901267 | 0.4019187701892775 |
| <input type="checkbox"/> | CompleteSource_130097_0003 | 3425114823742974720 | 1.6182802384704114 | 20.517780727768972 | 0.4020303469978408 |
| <input type="checkbox"/> | CompleteSource_130097_0003 | 3425114823745120512 | 1.6182794166233065 | 0.534499046224391 | 0.4020499999301908 |

Transits

| <input type="checkbox"/> | file_name | source_id | transit_id | ac_win_coord | transit_time |
|--------------------------|---|---------------------|-------------------|---|----------------------------|
| <input type="checkbox"/> | AstroElementary_134755_0006 | 3425114617586286848 | 71044382629193047 | [6008, 10765, 7849, 23375, 5877, 2960, 16268, 27836, 28160, 4277] | 2017-05-05 15:27:27.522425 |
| <input type="checkbox"/> | AstroElementary_134756_0006 | 3425114617586286848 | 71048474888300196 | [9139, 14738, 21180, 27859, 3839, 32384, 20020, 18213, 13261, 19935] | 2017-05-05 17:14:01.677219 |
| <input type="checkbox"/> | AstroElementary_134757_0006 | 3425114617586286848 | 71058215738283403 | [32345, 14328, 19099, 11576, 21558, 31161, 19634, 26578, 30740, 5943] | 2017-05-05 21:27:41.755378 |

Console

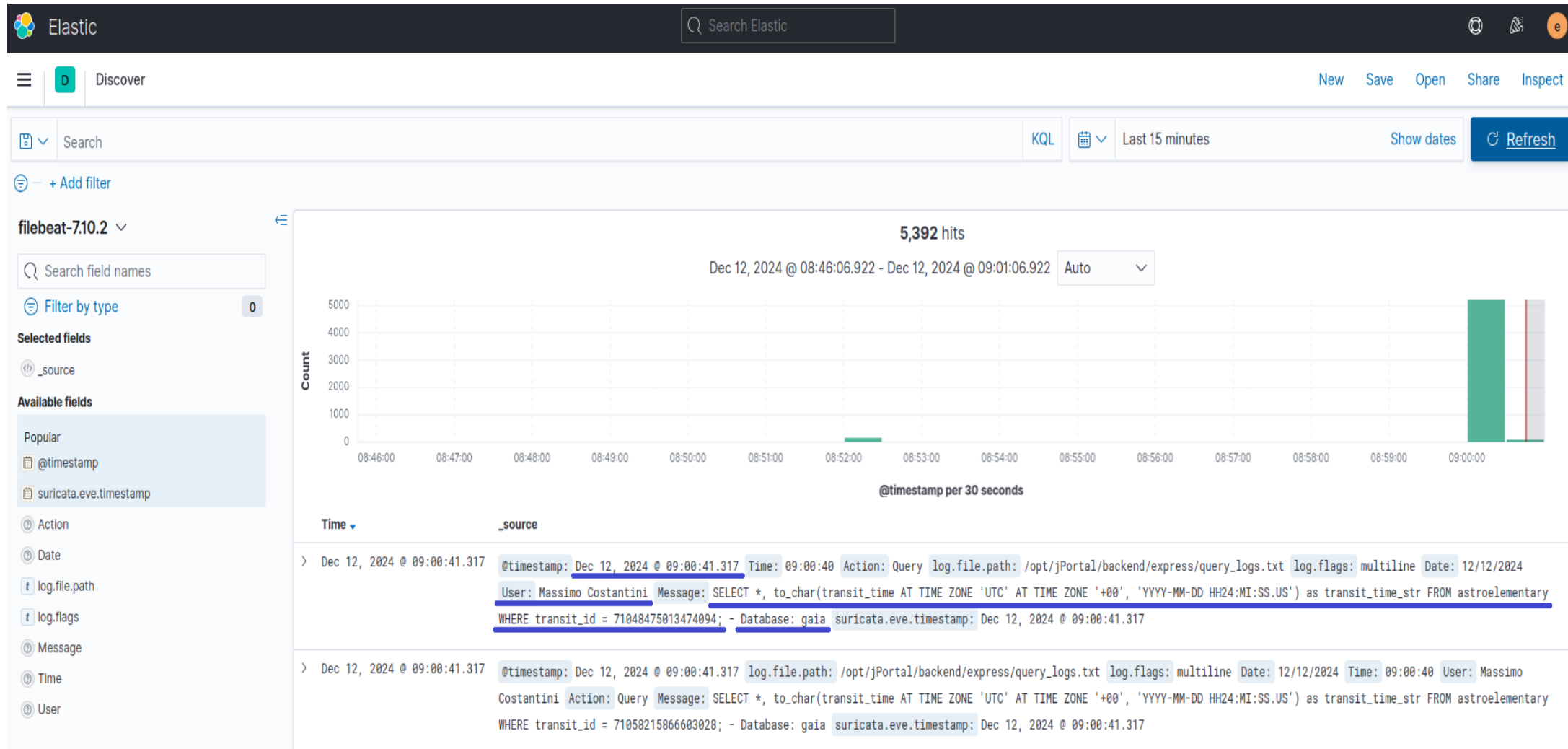
Gaia Merger

The resulting file can be downloaded via Rucio directly from the portal hiding the file's actual location on the MinIO backbone for security reasons.

The screenshot shows the jPortal interface for the Gaia Merger tool. On the left is a navigation sidebar with a hamburger menu icon and the text 'jPortal'. Below this are several menu items: 'Help' (with a question mark icon), 'Settings' (with a gear icon), 'Observation' (a sub-section header), 'Fermi' (with a folder icon), 'Gaia' (with a folder icon), 'Simulation' (a sub-section header), 'Pluto' (with a folder icon), and 'Ramses' (with a folder icon). The main content area has a top bar with six buttons: 'Resolve', 'Edit', 'Search', 'Results', 'Cut & Merge', and 'Reset'. Below this bar, the 'Cut & Merged' tab is active, showing a text input field labeled 'file_name' containing the value 'gaia_merger_23629d157c73b4a8d31f87722fb5d2b2_1733989722.352807'. Below the input field is a 'Console' tab, which is currently empty.

Elasticsearch / Kibana

All queries and downloads are logged using Elasticsearch and visualized via Kibana, including details such as timestamps, users and executed queries.



Next Steps

- **Interoperability: decide whether to send queries directly to PostgreSQL or through a TAP to obtain VOTables**
- **Interoperability: utilize a Data Link to provide a list of available services**
- **Fermitools integration: integrate Fermitools for enhanced functionality**
- **Visualization tools integration: incorporate visualization tools for better data representation**
- **Pluto and Ramses integration: implement integration with Pluto and Ramses**
- **PostgreSQL sharding: compare performances between PostgreSQL sharding and Oracle**

Thanks for your attention!