

# Data Central's Data Aggregation Service

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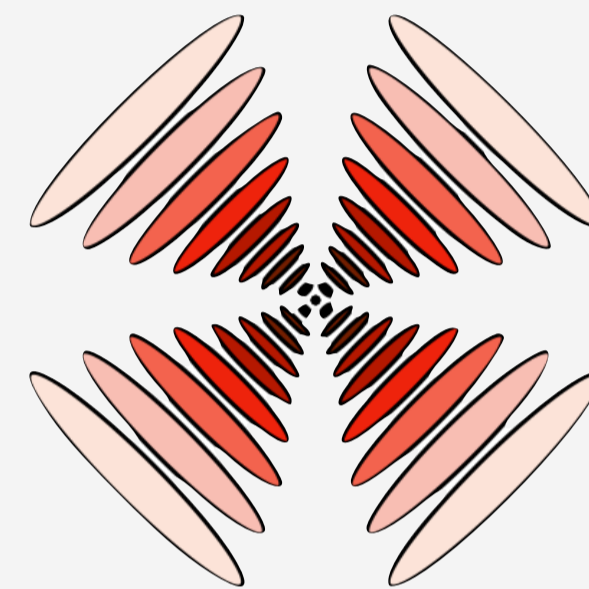
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## Introduction

Collating heterogeneous observational data is a routine task for astronomers. Manually searching individual telescope archives and data centres can be an onerous and an error prone process. Furthermore, archival data often needs to be reduced before use.



We have developed the Data Aggregation Service (DAS, [das.datacentral.org.au](http://das.datacentral.org.au)) as a versatile web platform to query and visualise astronomical images and tabular data for a given position in the sky (Fig 1). DAS queries multiple online sources simultaneously via a modern asynchronous Python backend. Results are added as soon as received.

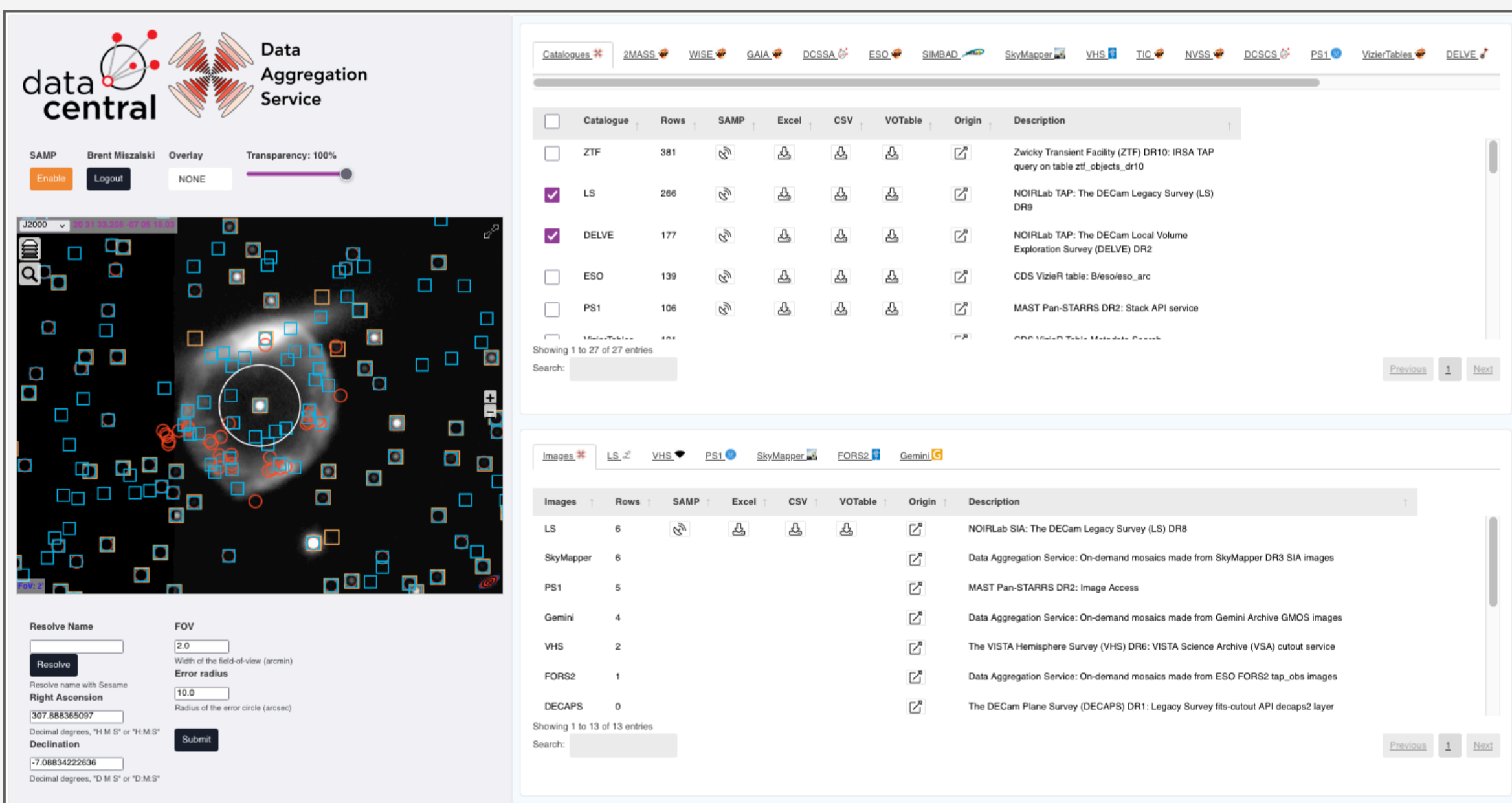


Figure 1. The DAS for Abell 70. Aladin Lite (middle left) is used to display catalogues (top right) and images (bottom right) retrieved by DAS. Sky position is specified via GET parameters or the Sesame (CDS) name resolver (bottom left).

## Asynchronous Design

DAS is an asynchronous Python application that combines the web framework **Starlette** and a **python-socketio** server. A wide range of services are simultaneously queried as individual asynchronous background tasks. Query results are processed and data sent to the browser for display via websocket messages. The task manager **Celery** is used to convert FITS images to HiPS format before display with Aladin Lite. Similarly, **Celery** and IPAC's **MontagePy** are used to build complex workflows for **on demand mosaics** of SkyMapper, Gemini GMOS and ESO FORS2 data (Fig 2).

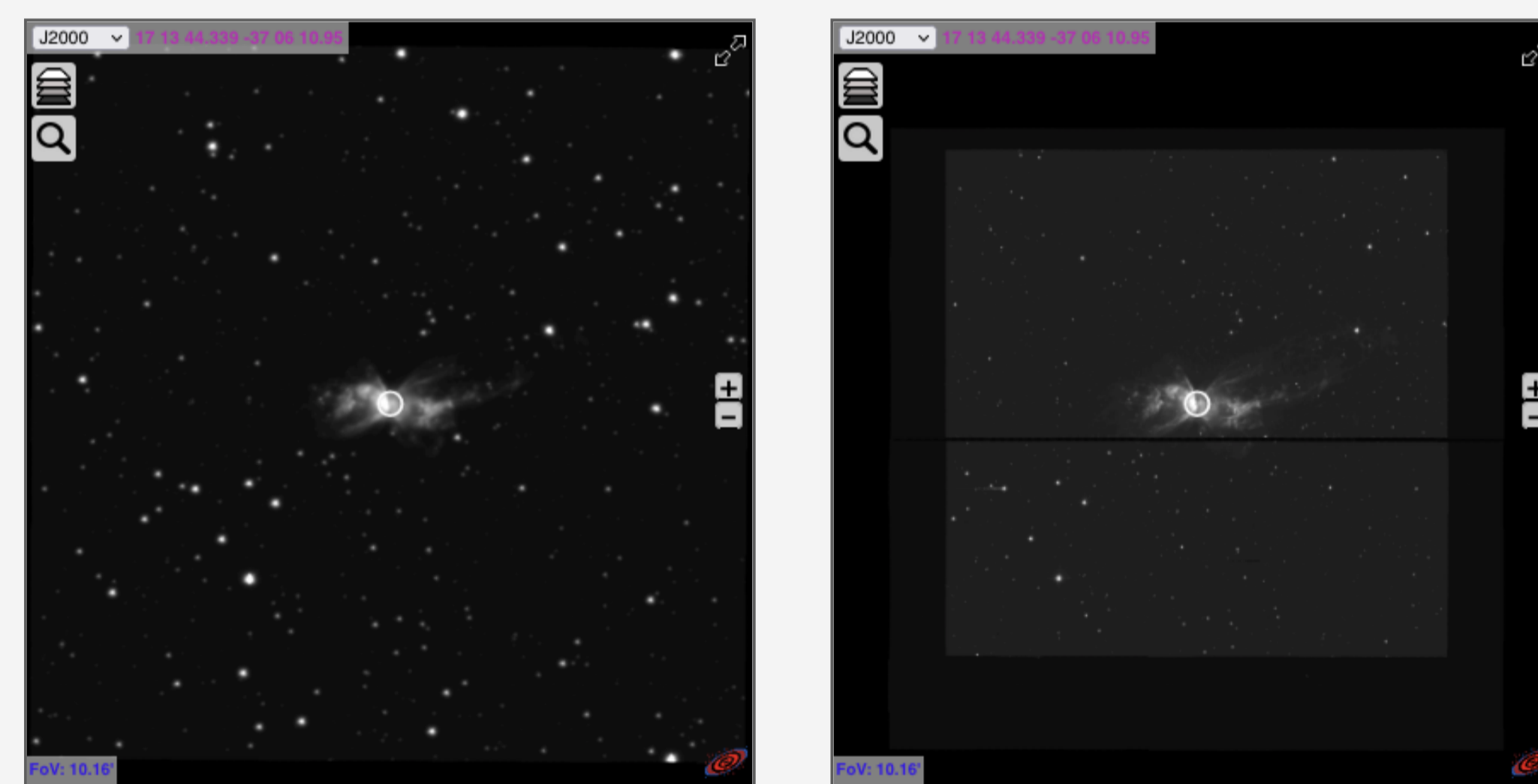


Figure 2. On demand mosaics of NGC 6302 generated by DAS from SkyMapper r-band (Left, 10"x10") and ESO VLT FORS2 R-band (Right). The white circle (20" diameter) reflects the default error radius of 10" users may specify as a parameter.

DAS serves as an incubator platform for the development of additional **Pipeline As a Web Service (PAWS)** systems. We plan to add new PAWS using ESO data reduction pipelines to enable on demand reduction of imaging and spectra.

## Notable Features

- ◆ Custom redshift aggregators that gather redshifts from all VizieR tables that contain UCDs of src.redshift(phot).
- ◆ A wide variety of queries are supported (e.g. IVOA TAP, SIA, SSA, SCS; VizieR; API endpoints). Results are cached with redis. Users may request new data sources.
- ◆ Users may configure what data sources to display individually via GET parameters (e.g. own VizieR tables).
- ◆ HiPS overlays of radio surveys (e.g. ASKAP RACS)
- ◆ Tabular data may be exported directly to TOPCAT via WebSAMP or downloaded as xls/csv/votable files. Images (including mosaics) can be downloaded.
- ◆ Data Central authentication allows for data access control based on user group affiliation (e.g. SkyMapper).
- ◆ Extensible platform for new app development (Fig 3).
- ◆ More information: <https://docs.datacentral.org.au/reference/services/data-aggregation-service>

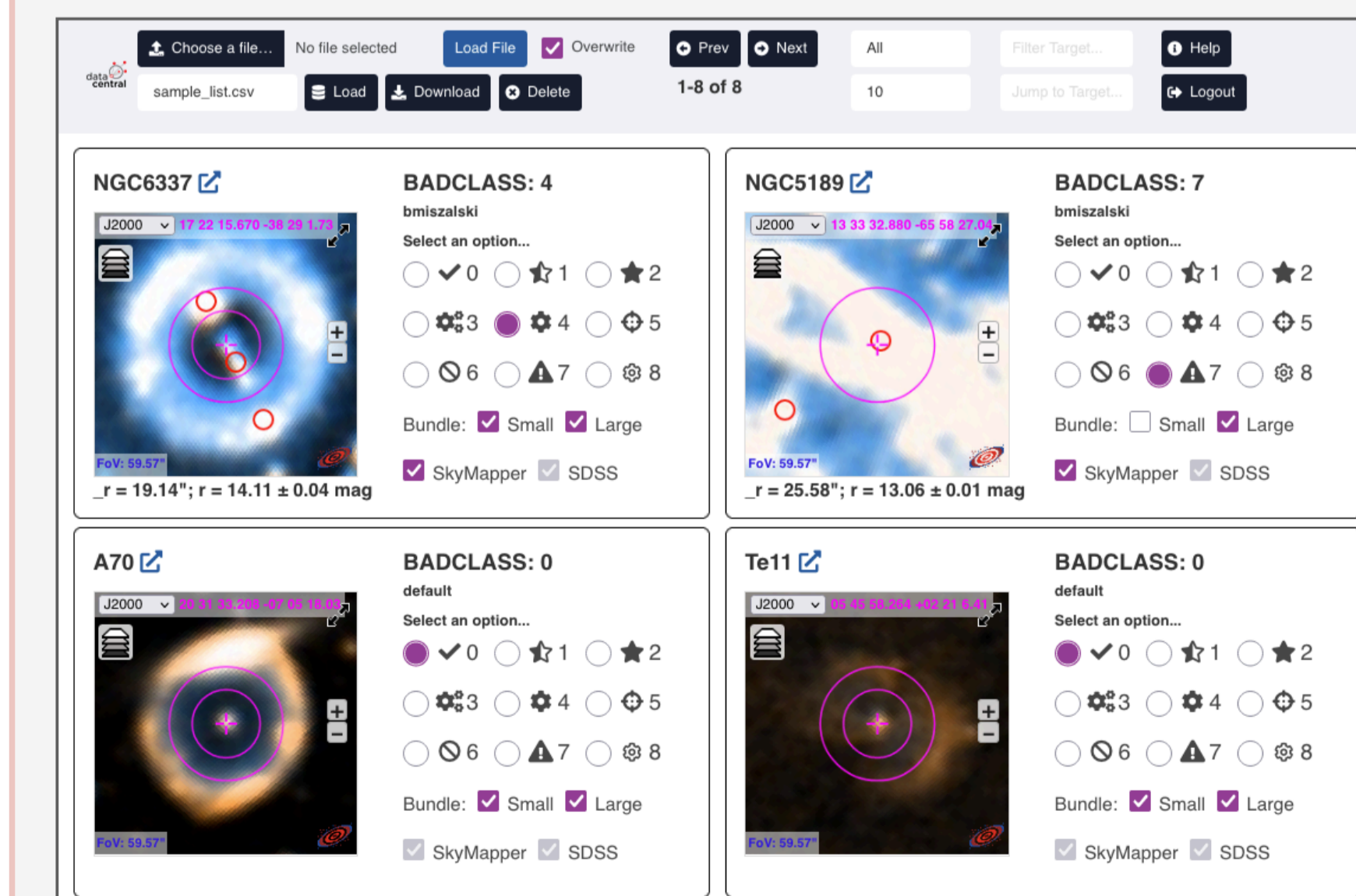


Figure 3. A prototype target visualisation and classification application that uses DAS architecture in a paginated layout. Multiple Aladin Lite instances display images of the targets and the results of asynchronous catalogue queries.



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