

Visualization in IRSA Services using Firefly

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Caltech / IPAC

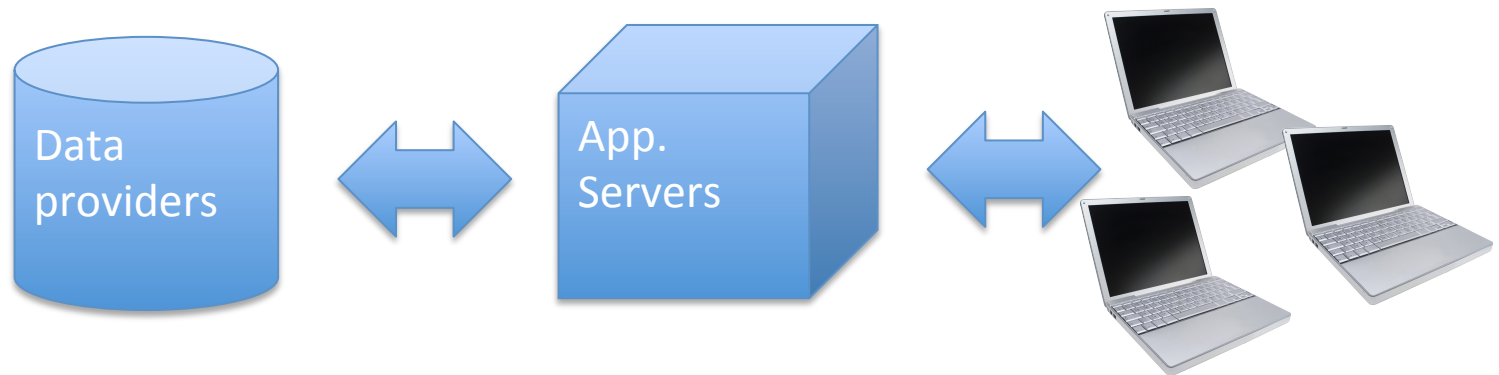
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ADASS XXVII
College Park, MD



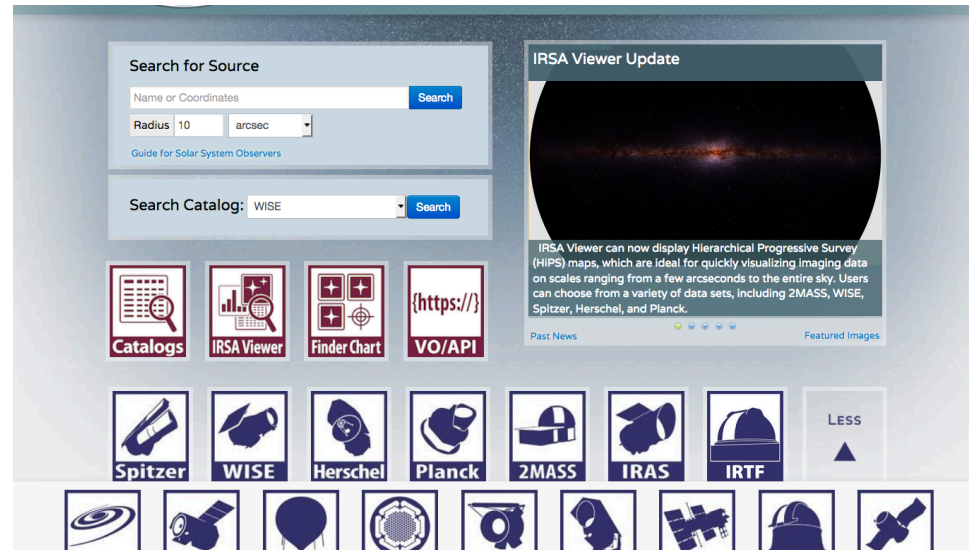
Data driven (archives)

- [IRSA](#) hosts >1PB of data from over 15 projects
- Data extraction, exploration and visualization
- Long-term software dev and maintenance
 - UX learning curve is faster and UI consistent across site
 - Software engineering / Scrum / Good practices
- API companions, UI build on top



Challenges

- Data view as Images, charts and tables
- Interactivity and interconnectivity
- “User friendly” access
- Rely on services running closer to the data
- Reusable and derived components across projects and datasets



Technical

- [IPAC/Firefly open-source](#) library to build UI core components based on ReactJS/Java
 - ✓ IPAC contributors, collaborative development across IRSA, LSST and NED
- Web-based applications
 - Server/client UI apps sharing common library/stack (*apache + tomcat*),
 - Running HTML/JS client from *ES6+ (npm+redux+sagas+plotly+,etc.)*
 - And *Java* layer on the server side, staging searches from DB/APIs/VO
 - *Gradle/Jenkins* for building/testing
 - GitHub PRs docker/kubernetes



Usage

- Main widgets: FITS image viewer, tables and charts
- Main features related to data brushing and linking
- Science data tools:
 - [Time Series](#) tool for light-curve datasets
 - Finder Chart for cross-comparison of images from various surveys (+[API](#))
- Project specific apps: i.e. [WISE](#), Spitzer, Planck, Herschel, contributed products.
- Recently: HIPs, periodogram, instrument footprints
- Stack exposed via high-level JS API or standalone using full React classes (low-level)
 - Framework composition used to ease maintenance and new development
 - Exposed properties to control project specific requirements

(near) Future

- Updates coming soon including
 - New available image datasets for searching IRSA archives
 - Footprint overlay improved (dev/[test data](#))
 - MOC outline maps
- Existing integration with other languages to enable science platform access to run code closer to data for mining and cross exploration with big-data
 - [Python integration](#) within notebooks/JupyterLab exists already
 - Same UI widgets are exposed to allow multiple integration
- Constant effort to adopt modern web technology to enable richer features and take advantage of 3rd party libraries running in browsers



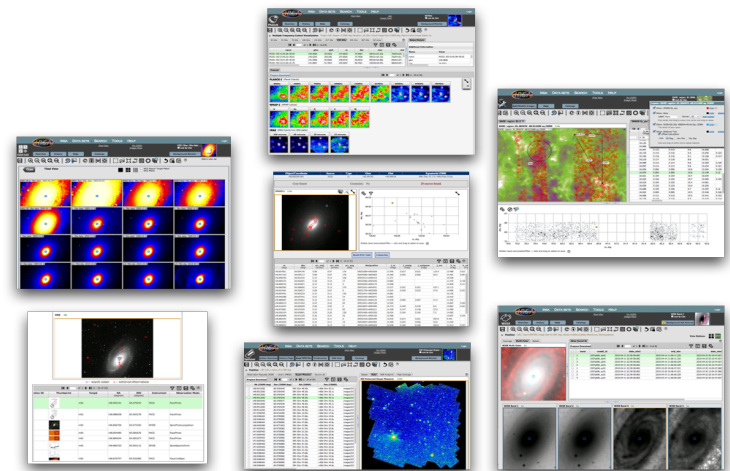
Applications/API

- Dataset/project specific
 - [WISE](#)
 - [Herschel](#)
 - [NED](#) / [Atlas](#)
- Science tool
 - [IRSAViewer](#): table/chart/image
 - Light-curve: [time series tool](#)
 - Finder Chart: All-in-one, [URL API](#)

Demo outline

- Brushing with histogram/charts: IV catalog search, with error bars, column expression (i.e. WISE)
 - Gator -> Light-curve / Period finder with [periodogram](#) ([WISE/PTF](#))
- HIPs demo , with URL (+ ivo://), ex: <https://irsa.ipac.caltech.edu/data/hips/list>
 - [Footprint](#) overlay (JWST) – layers control
- API html integration: [Atlas](#), [Herschel](#) or [NED](#)
- IRSA [Finder Chart](#) application
- Python integration
- Dev: MOC, new Footprint tool

<https://github.com/ejoliet/adass2018>



Step by step demo

- 1. Brushing/Linking** example with Time Series tool
 1. WISE light-curve search ([Gator](#))
 2. Save table (via IRSA workspace) and Upload to Time Series tool
 3. Or Launch to Time Series tool
 4. See periodogram
 5. HTML format axis label!: $\log(v)$ [Hz]
See docs [here](https://ui.adsabs.harvard.edu/#abs/1999AJ....118.2561G/abstract)
- 2. HIPs:** Discover or Catalog search with IV
 1. See HIPs, change to others
 2. Plot error bars, new column based on new math. Expression (WISE color color)
 3. Add by URL or ivo://, see here: [hips servers](#)
- 3. API:** Herschel, Atlas, NED...
 1. Search Herschel, see coverage footprint
 2. Launch image viewer
 3. Show NED integration of FinderChart/IRSAViewer
 4. See SIA search URL used in example under 'demo' folder, url sample [here](#)
4. Finder Chart, and [API mode](#)
- 5. Python / Jupyter** notebook, see next slide
6. In development
 1. **Release soon: MOC, footprint enhanced**
 2. Future: demo with 'slate' with 3D chart and custom layout



JavaScript API sample

Sample code taken
from IRSA Atlas

```

<!--load the firefly tools javascript -->
<script type="text/javascript">
  {
    onFireflyLoaded= function(firefly) {
      window.extViewer = firefly.getViewer();
      firefly.setGlobalImageDef({
        ZoomType : 'TO_WIDTH'
      });
      firefly.debug= true;
      tblReq = firefly.util.table.makeFileRequest('', 'https://irsa.ipac.caltech.edu:443//workspace/TMP_jwFPx0_378/Atlas/
204.159607_41.489799_eq_378.v0001//img_subset_whdr.txt', null,
        { pageSize: 50, META_INFO: {CENTER_COLUMN: 'ra;dec;EQJ2000'}
        });
      firefly.showTable('tableHere', tblReq, {removable: false,
        showTitle: false,
        showUnits: true,
        showFilters: false,
        selectable: false,
        rowHeight: 40,
        expandable: false,
        help_id: "tables"});

      extViewer.setDefaultParams({ "TitleOptions" : "FILE_NAME",
        "ZoomType" : "TO_WIDTH",
        "ColorTable" : "1",
        "PreTitle" : "Abell1763",
        "PostTitle" : "204.159607 41.489799 eq",
        "overlayPosition" : "204.15961;+41.48980;EQ_J2000",
        });
    }
  }
</script>
<script type="text/javascript" language='javascript' src='/irsaviewer/firefly_loader.js'></script>

```

API to build js docs: `gradle :buildJsDoc`

<http://localhost:8080/firefly/docs/js/> or file:///Users/ejoliet/projects/firefly/build/firefly/war/docs/js/index.html

Python demo

1. Demo python, run in CLI:

```

> git clone https://github.com/Caltech-IPAC/firefly_client.git
> cd firefly_client/
> pip install -e .
> wget http://web.ipac.caltech.edu/staff/roby/demo/2mass-m31-green.fits
> wget http://web.ipac.caltech.edu/staff/roby/demo/m31-2mass-2412-row.tbl
> python # to enter in python console, see next
  
```

in python console, import files and launch viewer (see [docs](#)):

```

from firefly_client import FireflyClient
fc = FireflyClient('https://irsa.ipac.caltech.edu/irsaviewer')
  
```

show image

```

fval = fc.upload_file('2mass-m31-green.fits')
fc.show_fits(fval)
  
```

display table

```

tval = fc.upload_file('m31-2mass-2412-row.tbl')
fc.show_table(tval)
  
```

2. Notebook, run in CLI and see notebook under ./examples:

```

> jupyter notebook
  
```