



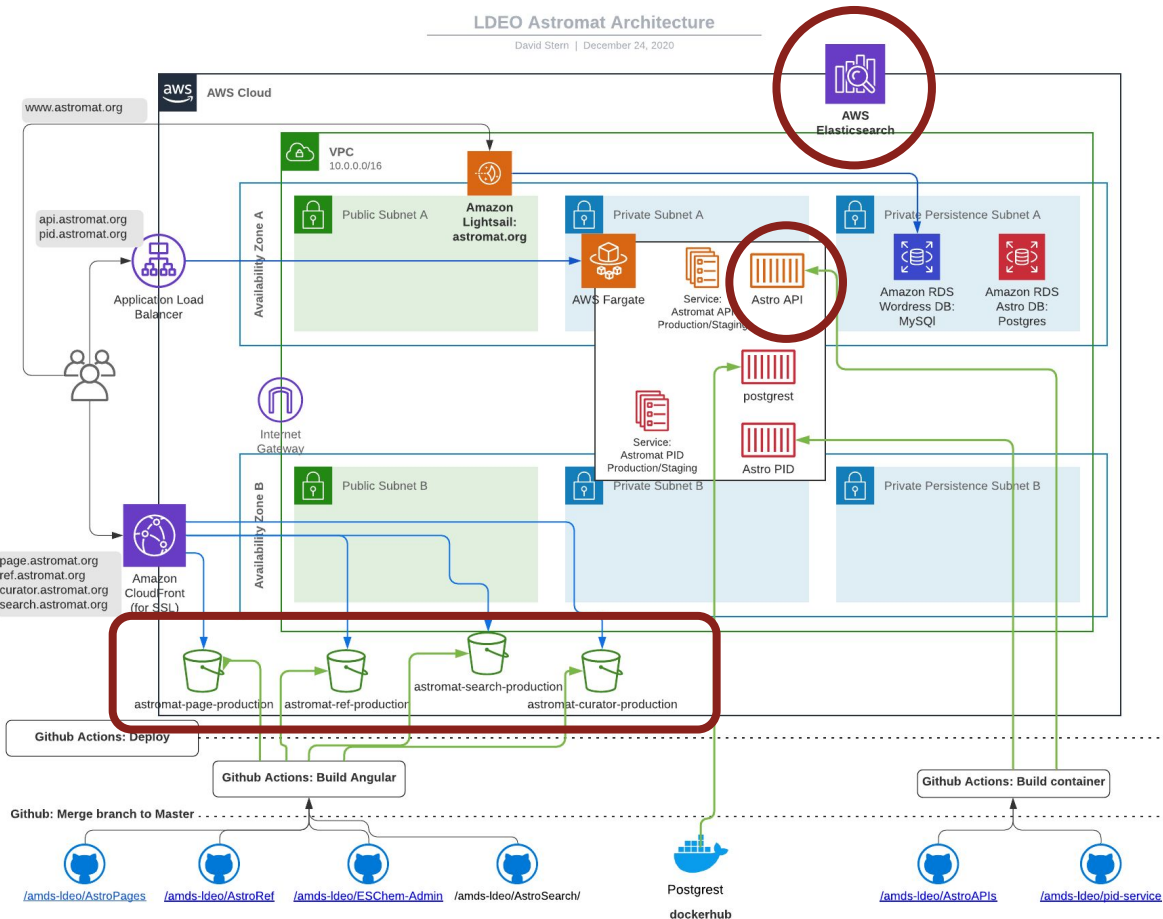
MAINTAINING MICROSERVICES: APPLICATIONS FOR THE ASTROMATERIALS DATA SYSTEM

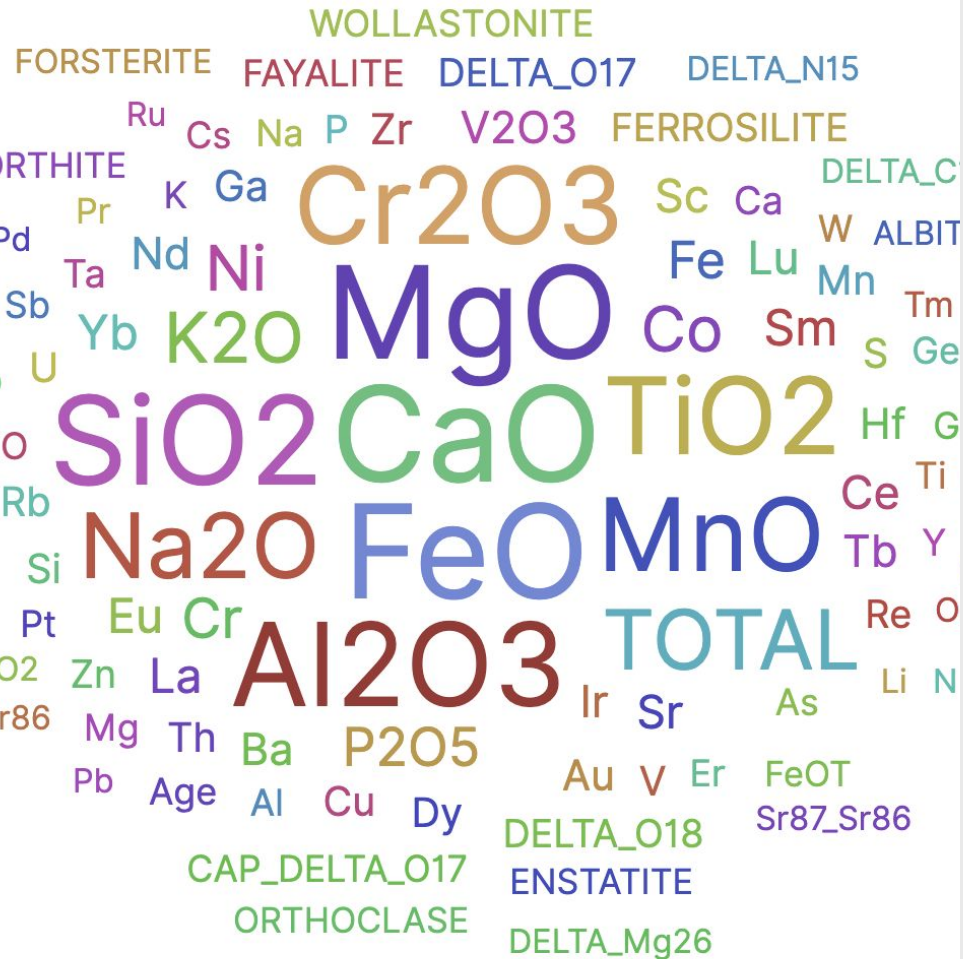
Planetary Science Informatics and Data Analytics (PSIDA) conference
June 23rd, 2022

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Lamont-Doherty Earth Observatory, Columbia University, New York, USA

What is AstroMat?

Astromaterial Data System (AstroMat) is a comprehensive data system for laboratory analytical data generated by the study of astromaterials. It is designed as an ecosystem of interconnected applications that provide human- and machine-readable interfaces to the data gathered and managed in AstroMat's databases.





AstroMat Data

With 777,896 chemical data points for lunar (349,610) and meteorite (394,452) collections consisting of 51% mineral analysis, 42.74% rock analysis and 6.2% inclusion analysis, the AstroMat data system aims to become a one stop-shop for curated astromaterials data.

– *Text cloud of chemical variables as they exist in AstroMat.*

Astromat Search

Version 2.1.0 Beta

This application is in beta, so feel free to send us any [comments](#), [reports](#), and [suggestions](#) as we continue to improve the interface.

AstroMat Faceted Search

Pre-built static javascript applications using functional programming techniques deliver modular code used to deliver user-friendly front-end applications with quickly accessible data.

The flow of data comes from relational databases, to an elasticsearch index, to API, to front-end applications, and finally to end user(s).

FILTERS ANALYSIS VARIABLES OUTPUT

F Collections: UCLA Cosmochemistry Database X A Bulk Materials:

Select Filters Analyzed Materials 3 Chemical Variables

Filter by chemical variables. Leave range default to return all occurrences or input Min and Max to refine.

Search variables

Any selected variables are present.

COLLECTIONS MISSION GEO FEATURE


Select a graph from the above options. After options below to customize your graph.

Subcategory
Trace Element

Trace Element

<input checked="" type="checkbox"/> Ir μg/g	Min 0.006	Max 10.5
<input checked="" type="checkbox"/> Ge μg/g	Min 1.47	Max 2050
<input checked="" type="checkbox"/> Ni %	Min 5.88	Max 15.2
<input checked="" type="checkbox"/> Ni	Min	Max

Varia



FILTERS ANALYSIS VARIABLES OUTPUT Collections: LUNAR S

Select Filters Analyzed Materials

Drag a column header here to group by that column

<input type="checkbox"/>	Sample	Dataset	Citation
<input type="checkbox"/>	10017-33	MAJOR AND TRACE E...	WÄNKE,1970
<input type="checkbox"/>	10018-22	MAJOR AND TRACE E...	WÄNKE,1970
<input type="checkbox"/>	10044-32	MAJOR AND TRACE E...	WÄNKE,1970
<input type="checkbox"/>	10057-40	MAJOR AND TRACE E...	WÄNKE,1970
<input type="checkbox"/>	10060-16	MAJOR AND TRACE E...	WÄNKE,1970
<input type="checkbox"/>	10084-18	MAJOR AND TRACE E...	WÄNKE,1970
<input type="checkbox"/>	12001.114	MAJOR AND TRACE E...	WÄNKE,1971
<input type="checkbox"/>	12001.912.2	Results of instrumen...	BARRA,2006
<input type="checkbox"/>	12001.911.1	Results of instrumen...	BARRA,2006
<input type="checkbox"/>	12001.907.5	Results of instrumen...	BARRA,2006
<input type="checkbox"/>	12023.146.2	Results of instrumen...	BARRA,2006
<input type="checkbox"/>	12023.145.3	Results of instrumen...	BARRA,2006
<input type="checkbox"/>	12024.074.4	Results of instrumen...	BARRA,2006
<input type="checkbox"/>	12032.108	NEW ABUNDANCE DE...	GARG,1976
<input type="checkbox"/>	12032,366.18	Results of instrumen...	BARRA,2006
<input type="checkbox"/>	12032,366.41	Results of instrumen...	BARRA,2006
<input type="checkbox"/>	12032,366.7	Results of instrumen...	BARRA,2006
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<input type="checkbox"/>	12032,366.30	Results of instrumen...	BARRA,2006
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<input type="checkbox"/>	12033.634.18	Results of instrumen...	BARRA,2006
<input type="checkbox"/>	12033.634.6	Results of instrumen...	BARRA,2006



12001

LUNAR SAMPLES

[Metadata](#)

Metadata

Expedition

Name
APOLLO 12

Taxons

Name
Soil » Unsieved

Type
Soil

External Links

Virtual Microscope

[More Info](#)

NASA Sample Catalog

[More Info](#)

ASU Digital Petrographic Slide

[More Info](#)

PDS Geosciences Node Spectral Library

[More Info](#)

Landing Page Philosophy

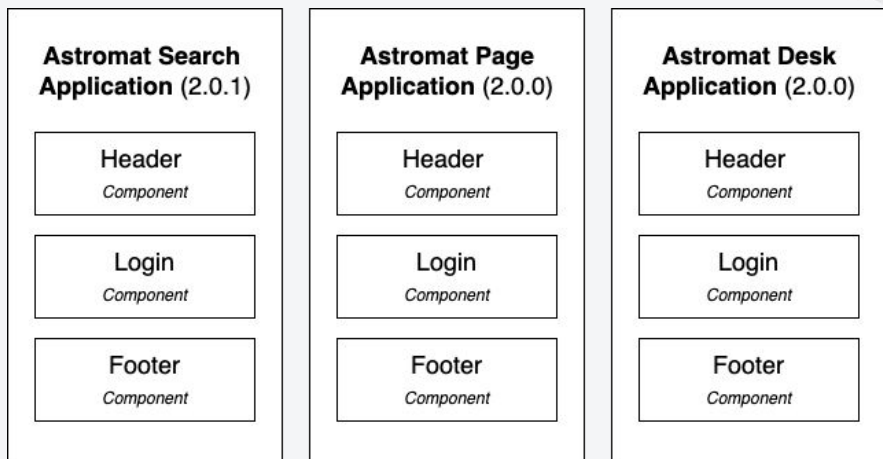
After search and export features, AstroMat looks forward to designing dynamic parent sample pages that contain aggregate metadata and links to appropriate external resources.

Our landing pages will also include a hierarchical representation of all samples and aggregate sample data representing analysis done and sample sub-components.

Maintaining Front-End Applications

Employing the Modular Federation
Approach

Current State of Frontend Applications

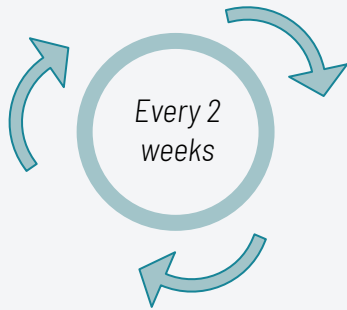


- Request data from API resource, which pulls data from an elasticsearch index.
- Single Page Applications (SPAs) all have duplicate components including header, navigation, login, and footer components.
- All SPAs are stored in AWS S3 buckets through continuous deployment.
- All applications require similar design, usability, and interoperability.



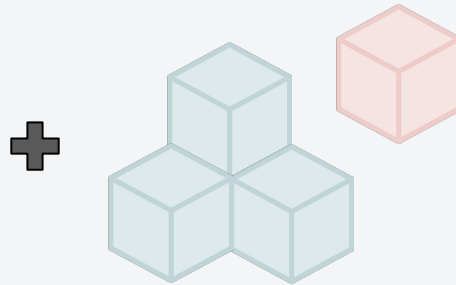
Why Modular Applications?

Agile *Sprint Cycle*



Compartmentalization of project management

Atomic *Design Methodology*



Design theory aims to treat applications as component pieces.

API - Driven *GET, PUT, POST, DELETE*



APIs distribute data according to application endpoint/query specifications



The Benefits of Modular Architectures

- Simple to update and refactor application components.
- Decrease complexity makes it easier to maintain.
- Enhanced collaboration since developers can focus on pieces rather than the entire system.
- Readable code due to decreased complexity and functional programming approach.
- Bugs are easier to detect and address.
- Modular components are reusable.
- Iterative development and continuous deployment.

Moving towards *distributed*, *decentralized*, *dynamic*, and *cloud-based* web applications.



The Drawbacks of Modular Architectures

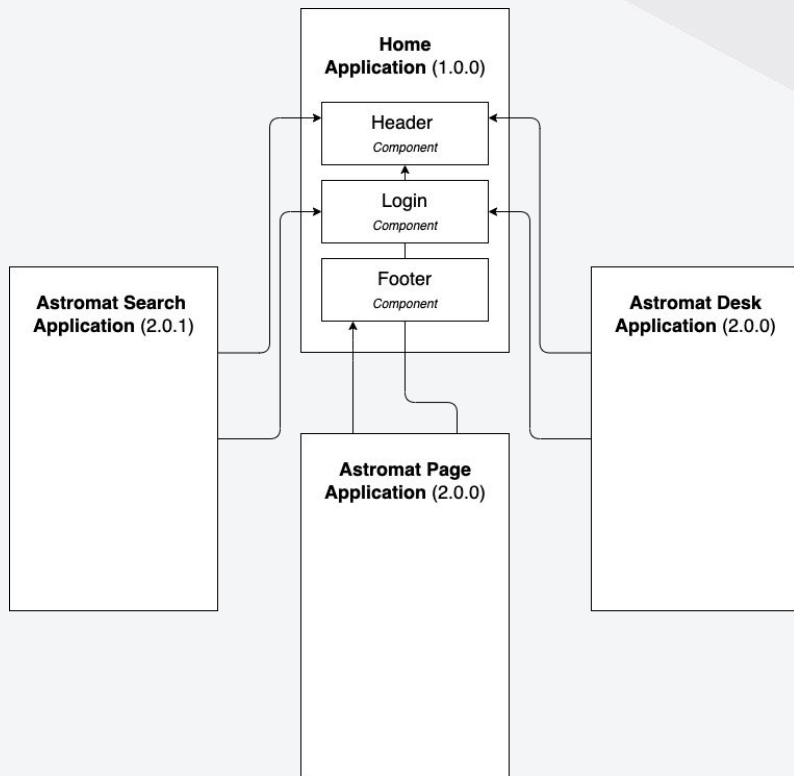
- Higher initial investment.
- Greater planning complexity.
- Continuous monitoring to maintain codebase.



Ok, so modular is good. Now what?



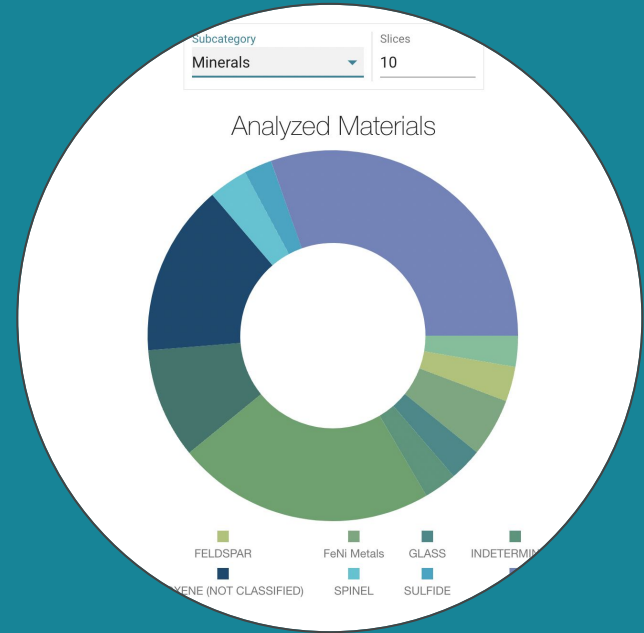
Modular Federation - Home Application



- All applications are still independent of one another, but gather components from the *Home Application* which hosts the shared components (Header, Footer, Login, etc.)
- In this scenario, modular federation is taken from a built and deployed static asset store (AWS S3).
- Home App modular components are shared through a remote entry webpack configuration.



Multiple components are taken from a single asset store to feed modular applications.



In conclusion...

Micro-frontends Enhance Maintenance of Modular Applications

Although caveats exist, such as initial investment and planning requirements, designing micro-frontends to be consumed by modular applications can effectively reduce the maintenance costs of updating reusable components while maintaining cohesive and non-duplicative code. Projects looking to maintain API-driven single page applications should consider implementing modular federation for ease and efficiency of maintenance.

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