



Planetary Bodies: Mapping
STAC Data

Team Members

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Client

United States Geological Survey (USGS)

Astrogeology Science Center

Big Picture



- More than **250 robotic spacecrafts** and **24 humans** have explored beyond Earth.
- **Hundreds of terabytes** of data gathered every hour.

Clients



Trent Hare - Cartographer



Dr. Jay Laura - Software Lead



Problem

- Collection of ARD (Analysis Ready Data)
- Difficult to Access
- Client's STAC API New and Unknown



STAC

SpatioTemporal
Asset Catalog

The Data

- Data footprints
- Close up on a surface of a planetary body
- Used by planetary scientists



The screenshot displays the MARS GeoSTAC interface. At the top, the 'MARS' title is followed by longitude (146.689) and latitude (-0.839) coordinates. Below this are navigation controls for 'EAST', 'WEST', 'CENTRIC', and 'GRAPHIC' views, along with zoom levels of 180° and 360°. The main map area shows a topographic view of Mars with several blue rectangular footprints overlaid. A sidebar on the right, titled 'Sort and Filter', includes an 'APPLY' button, a 'Sort By' dropdown, and a 'Filter By...' section with checkboxes for 'Selected Area', 'Keyword', and 'Date Range'. Below this is a 'Number of Displayed Footprints' slider set to 10, and a list of 'Footprint Results' with details for three items: P18_007883_1801_XN_00N, J03_046149_1781_XN_01S, and J04_046440_1942_XN_14N. At the bottom, a 'Query Console' shows a STAC query URL and options to 'COPY CODE', 'DRAW WKT STRING', and 'RUN STAC QUERY'. Navigation links for 'Documentation', 'User Manual', and 'GeoSTAC Project Website' are at the very bottom.

Solution

- Map of data footprints
- Filter parameters
→ STAC Queries
- Easy to find/view data with locational context

Requirements Review



View image footprints overlay within the web map



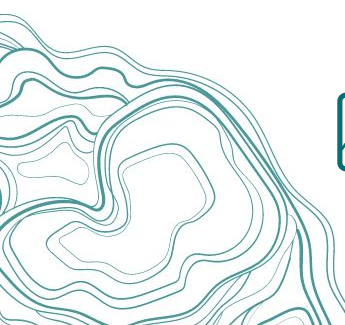
A query search functionality



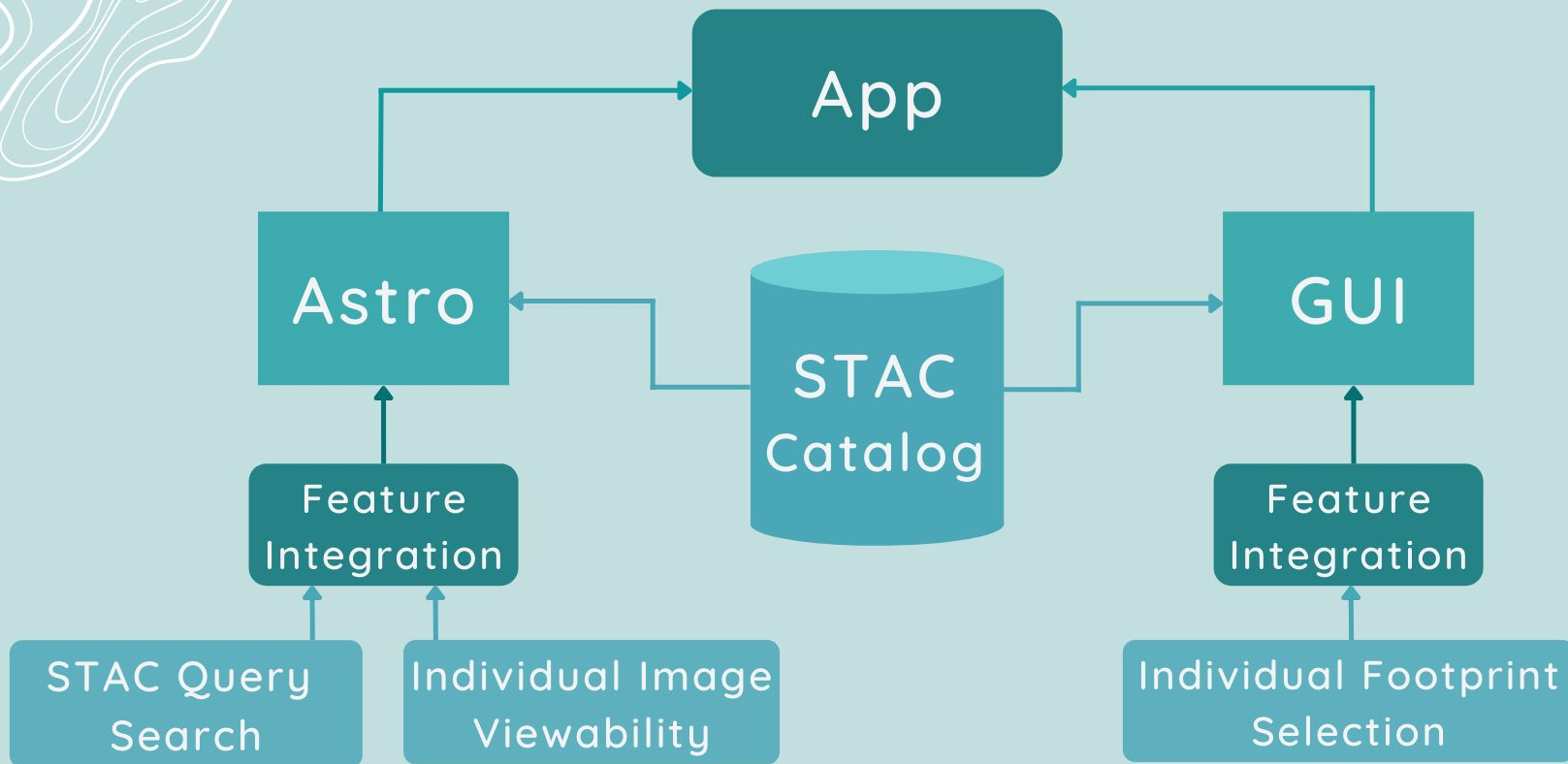
An interactive selection tool to select multiple footprints



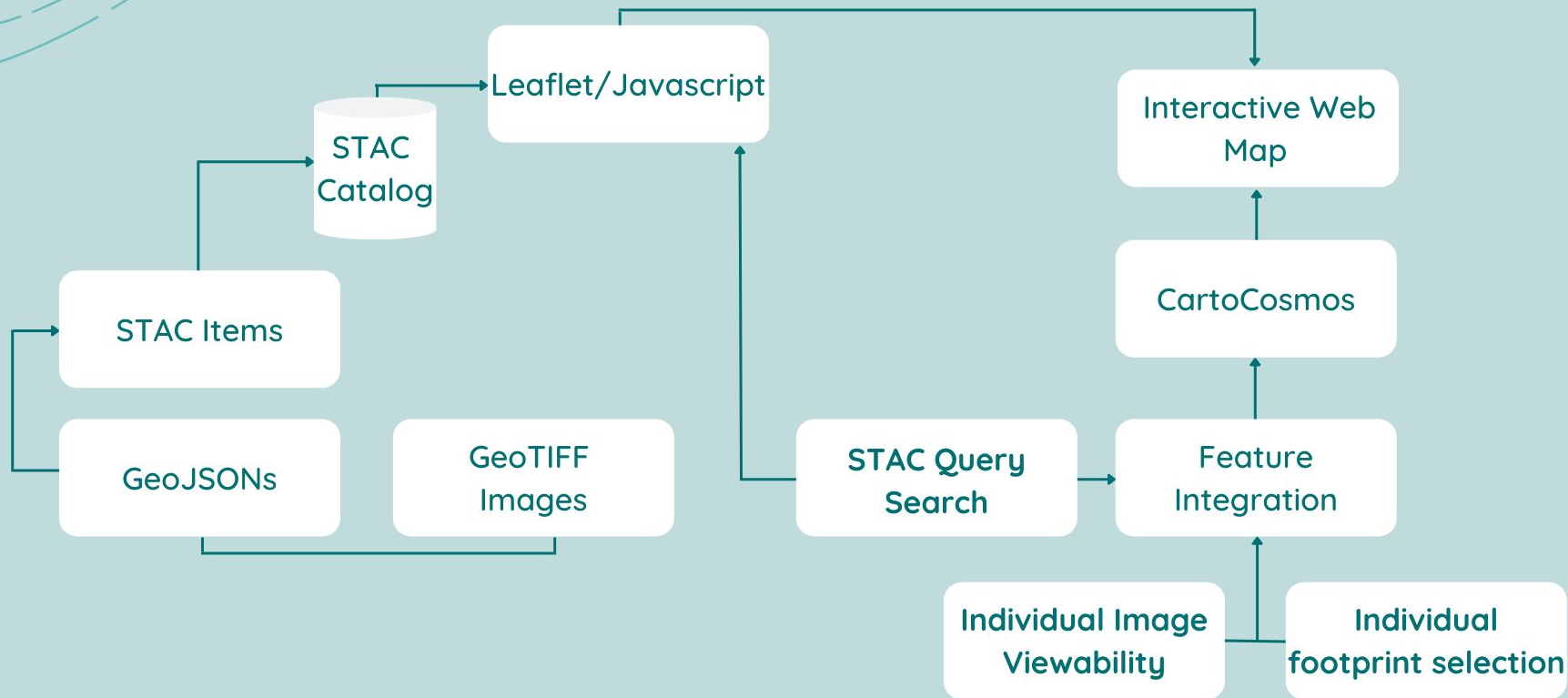
Display Cloud Optimized GeoTIFF (COG) images within the web map



Architectural Overview

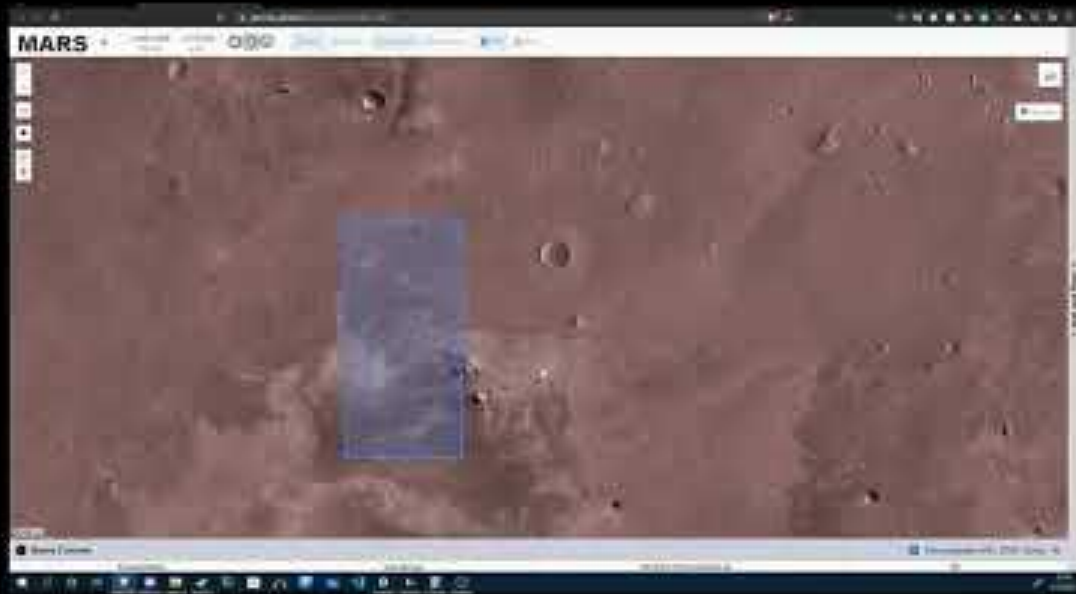


Implementation Overview



Prototype Review

 Footprint Overlay:

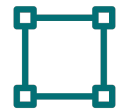


Prototype Review

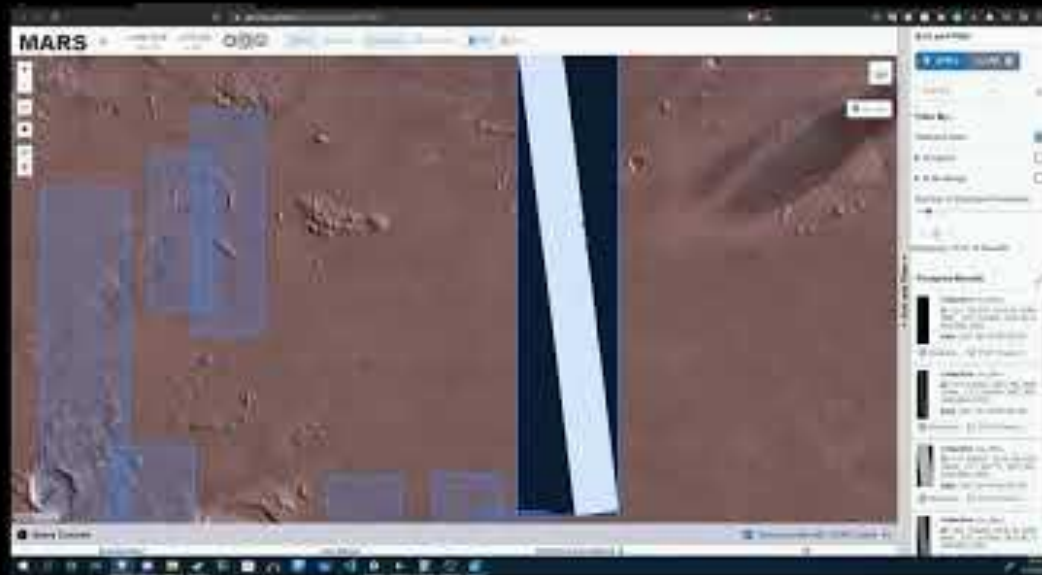
🔍 Query Search:



Prototype Review



Interactive Selection:



Prototype Review



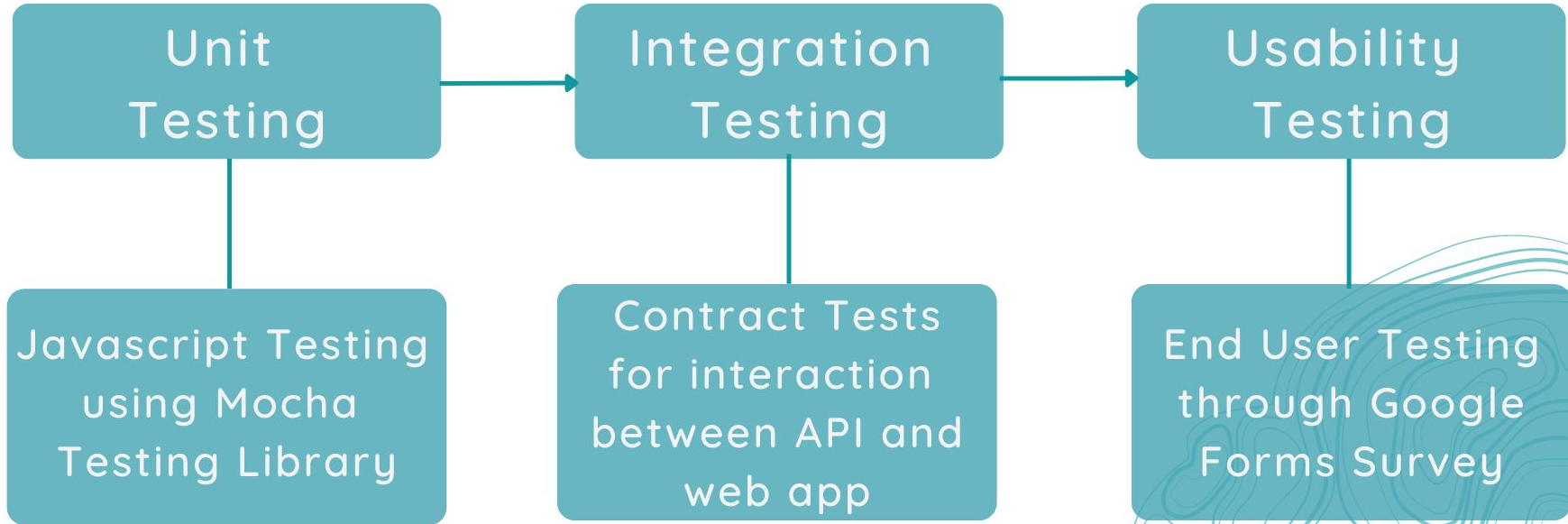
Display COG's:



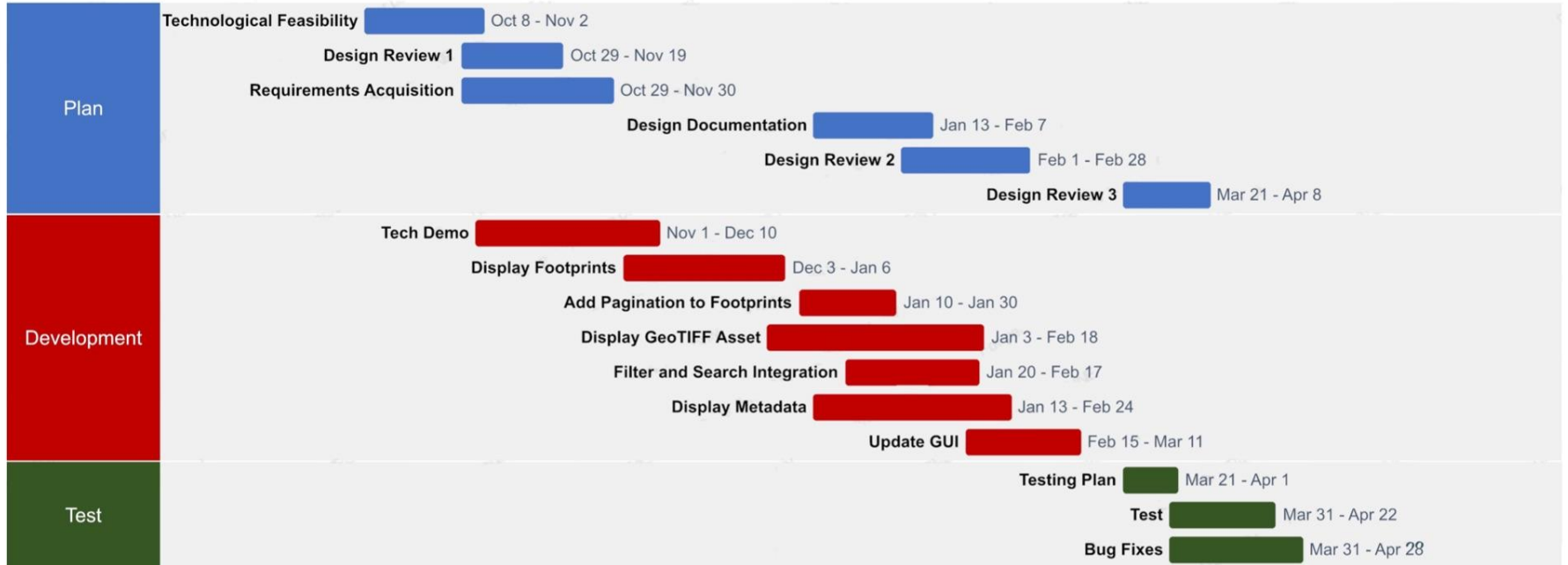
Challenges and Resolutions

Challenges	Resolution
Rendering GeoTIFFs in a Leaflet viewer	<ul style="list-style-type: none">● Render Footprint Thumbnails as JPGS● Potential tile layer to render GeoTIFFs
React component interactions with Leaflet DOM	<ul style="list-style-type: none">● Parse element from Leaflet DOM by selecting on HTML element
NPM packages from CartoCosmos are outdated and causing vulnerabilities	<ul style="list-style-type: none">● Clean up existing NPM variables and packages● Introduce conda environments for building and installing the application and required packages

Testing Plan



GeoSTAC Development Schedule



Future Work



Shopping Cart



Greater Interactivity

Conclusion

- Accessing Clients ARD with STAC API
- Develop a Web Application
- Successful Development Process
- Redesigning Planetary Map Data