ISRO STAC & STAC API Overview

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CEOS
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Earth Observation Satellites

STAC

An Optimal Strategy for archival / cataloguing / data discovery which would make the user experience better with respect to querying the data & meeting the Global Standards

Spatio-Temporal Asset Catalog **(STAC)**

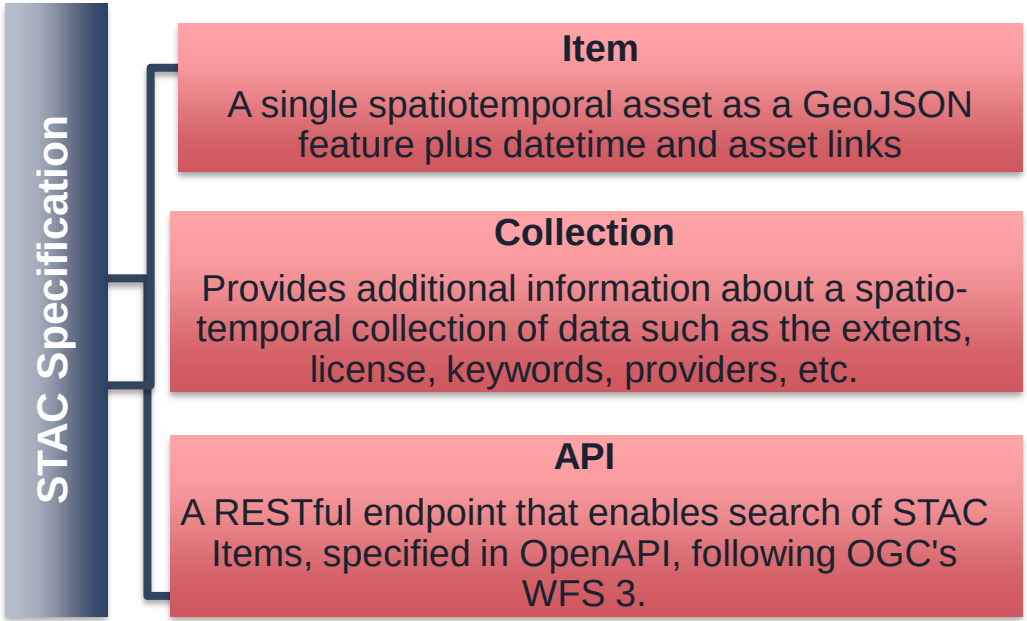
An open specification that evolved from different organizations coming together to increase the interoperability of searching for satellite imagery.

A standardized way to expose collections of spatial temporal data.

STAC is driving a uniform means for indexing , discovering and describing geospatial assets.

PGSTAC

- ✓ POSTGRESQL schema, functions & triggers , with hierarchy conforming to STAC specification implemented purely in SQL.
- ✓ Exposes Tables , Search extensions for STAC-FAST API.
- ✓ Single table storing all records across satellite sensors with partition over (satellite-sensor-mode-prodcode) and sub partitions over (year-month) and customizable indexing based on our user queries



Bhoonidhi STAC

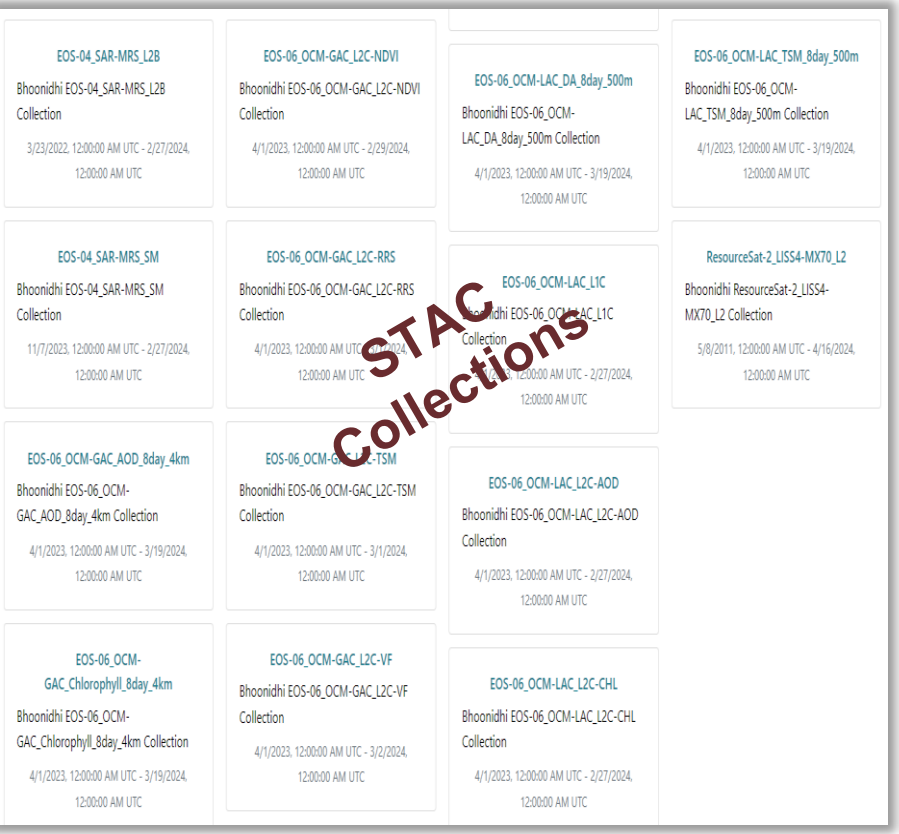
Data repository of remote sensing satellites of the Indian Space Research Organisation, facilitates the dissemination of satellite data products to online users on web.

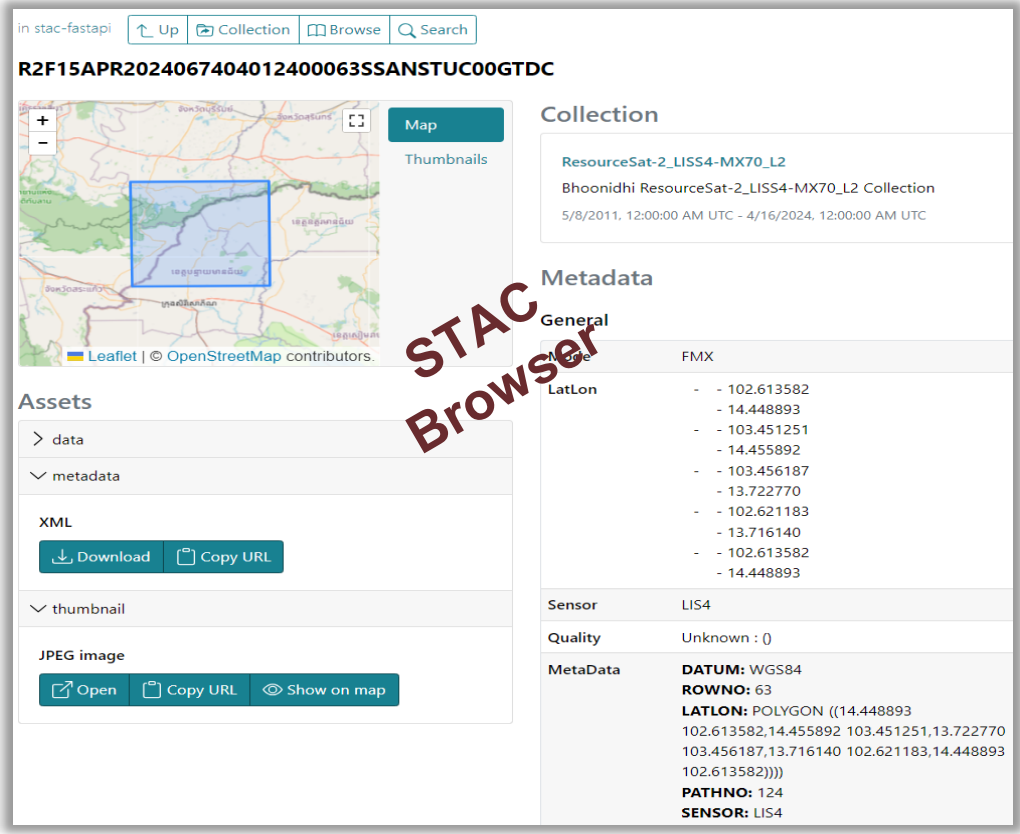
Enables access to archive of Remote Sensing data from 47 satellites, including Indian and Foreign Remote Sensing Sensors data acquired since 1986.

How STAC wil help us?

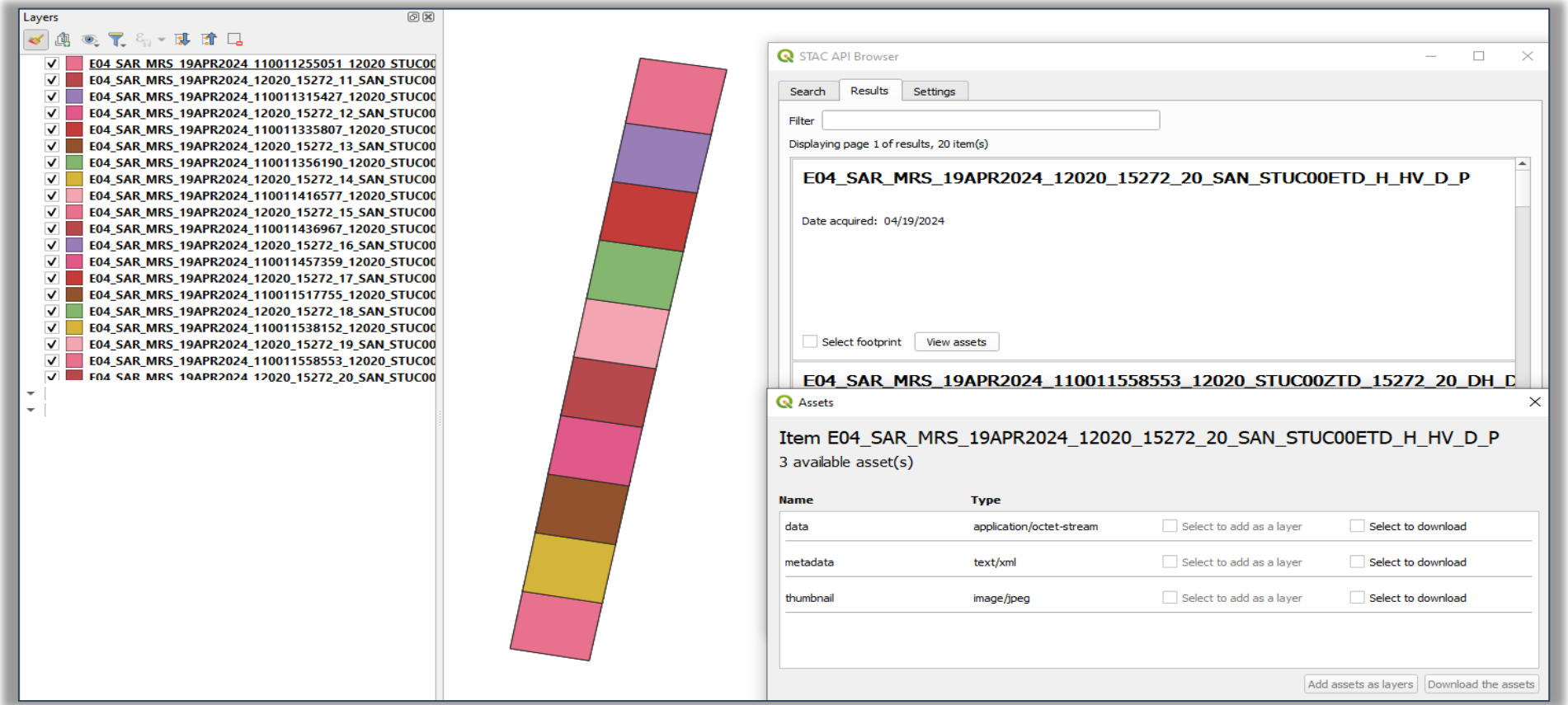
- Geospatial Queries are handled using collesctions
- Users can use same libraries to query Bhoonidhi catalogue , which are commonly used by other space agencies like NASA Earth Data , Sentinel on AWS and many more
- API generation & Specification document conforming to OGC & Open API Specification
- *Cloud Optimized GeoTIFF's inclusion in STAC will enable direct cataloguing of data in data cubes.

Bhoonidhi STAC



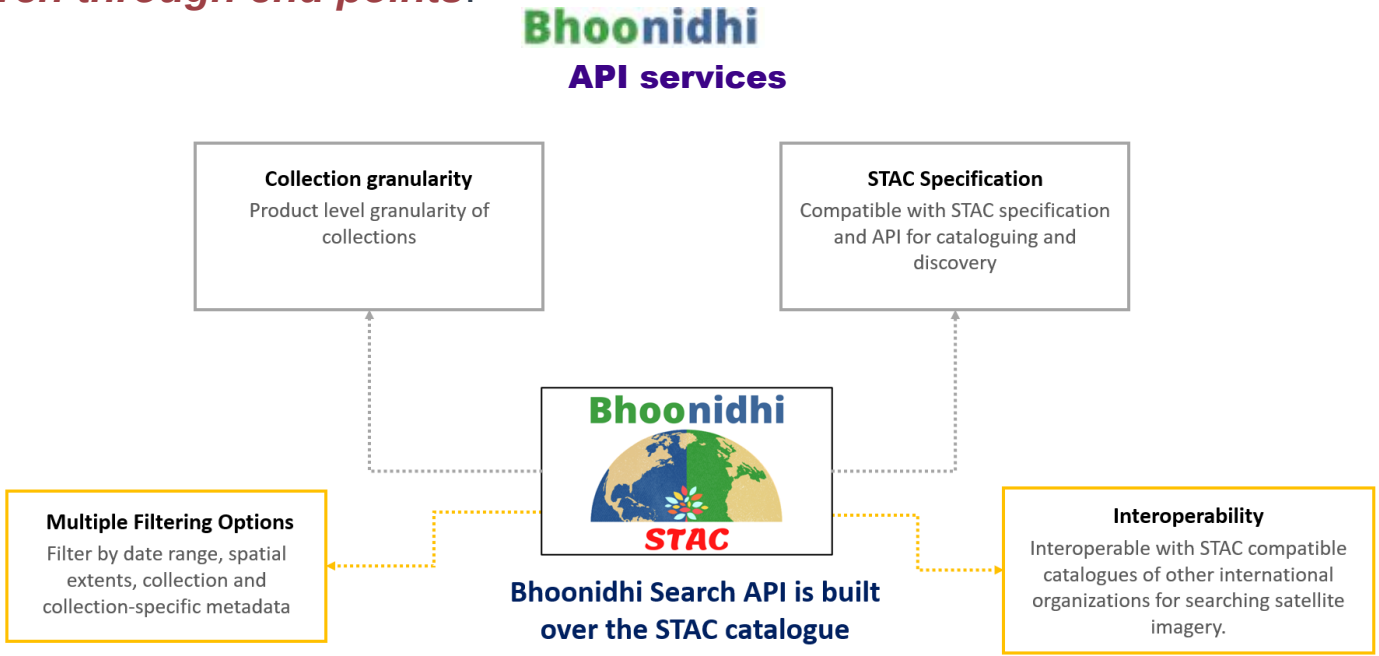


Bhoonidhi STAC in QGIS



STAC – Fast API

Project to expose PGSTAC based geospatial catalogues as Open search & STAC SPEC conforming API End points. Also supports search extension helping us implement geospatial search through end points.



STAC API @ Bhoonidhi

Bhoonidhi APIs for data-search and download facilitate users to automate browsing for satellite data products and the download process at their end

Bhoonidhi
API services

1 **Authentication**

This API allows you to get authenticated and receive tokens that enable search and download API access.

2 **Search**

This API enables various search option across collections of satellite-sensors. The data-search API is developed over STAC catalog, thus allowing STAC format GET and POST requests, making search interoperable.

3 **Download**

This API allows to download the open data products hosted at Bhoonidhi.

Filters in Bhoonidhi API

S.No	Field	Description	Format	Values
1	collections	Array of one or more Collection IDs	["col_id1", "col_id2"]	Above mentioned available collections
2	datetime	Date range	Single date+time, or a range ('Z' separator), formatted to RFC 3339, section 5.6	'2023-11-02T00:00:00Z/2023-11-03T23:59:59Z'
3	filter	Conditions to filter the data-sets	'args': [{'property': 'property_name'}, 'property_value'], 'op': 'condition'	'args': [{'property': 'Polarization'}, 'DH'], 'op': 'eq' Can be used to filter products available for direct download `see Examples (filter_by_online_status)`
4	filter-lang	Language of filter being used	'cql2-json'	'cql2-json' (fixed)
5	intersects	Searches items by performing intersection between their geometry and provided GeoJSON geometry.	GeoJSON geometry	"intersects": {"type": "geometry_type", "coordinates": [coordinate_array] }
6	limit	The maximum number of results to return	Integer value, max fixed to 200	10
7	page	Get the next page	Integer value	2
Default (when empty JSON is given): A set of 10 items from STAC catalogue are returned.				

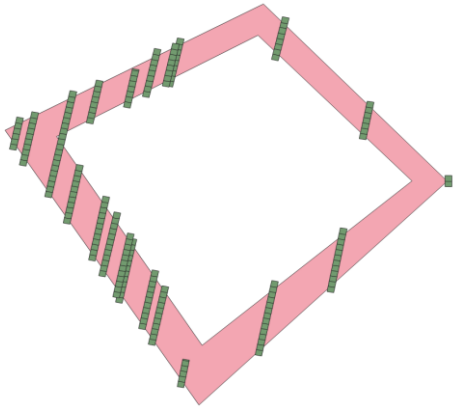
Bhoonidhi Search API Input

Example Input JSON Object for aoi_single_polygon

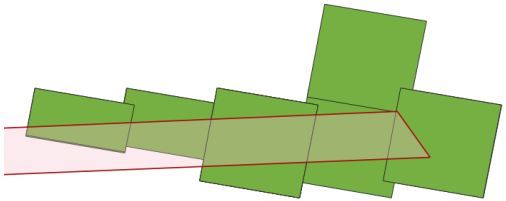
```
{
"collections": ["EOS-04_SAR-MRS_L2A"],
"datetime":"2023-01-01T00:00:00Z/2023-01-31T23:59:59Z",
"intersects": {
    "type": "Polygon",  //Other options - LineString, MultiLineString, Point, MultiPoint, MultiPolygon
    "coordinates": [
        [[-15.706019901023444, 17.50409862311953],
        [-15.204430443106522, 18.10105932077886],
        [68.43561166453935, 21.63831711003979],
        [68.93720112245624, 20.937274866185614],
        [-15.706019901023444, 17.50409862311953]]]
    },
"filter": {
    "args": [{"property": "Online"}, "Y"],
    "op":"eq"
},
"filter-lang": "cql2-json",
"limit": 200
}
```

Bhoonidhi Search API Result

Sample Results (returned as geojson object) with AOI:



Search results displayed over a polygon



Search results (zoomed in at an edge)


```
{
  "type": "FeatureCollection",
  "context": {
    "limit": 10,
    "returned": 10
  },
  "features": [
    {
      "id": "E04_SAR_MRS_31JUL2022_2526_2299_24_SAN_STUC00ETD_H_HV_D_P",
      "bbox": [ … ], // 4 items
      "type": "Feature",
      "links": [ … ], // 4 items
      "assets": { … }, // 3 items
      "geometry": { … }, // 2 items
      "collection": "EOS-04_SAR-MRS_ETD",
      "properties": {
        "Mode": "MRS",
        "Node": "DESCENDING",
        "LatLon": [ … ], // 5 items
        "Online": "N",
        "Sensor": "SAR",
        "Quality": "NA",
        "MetaData": { … }, // 77 items
        "Sat_Spec": "E04_SAR_MRS_DH",
        "Scene_No": "24",
        "Strip_ID": "2299",
        "datetime": "2022-07-31 01:08:29.078000",
        "IsDeleted": "N",
        "IsPartial": "P",
        "Satellite": "E04",
        "ProdLatLon": [ … ], // 5 items
        "CentreLatLon": [ … ], // 2 items
        "Dumping_Date": "2022-07-31 00:00:00",
        "Imaging_Date": "2022-07-31 00:00:00",
        "Polarization": "DH",
        "Dumping_Orbit": "2526",
        "Imaging_Orbit": "2526",
        "Look_Direction": "RIGHT",
        "Incidence_Angle": "37.79911",
        "Sat_Spec_Scheme": "Satellite_Sensor_Mode_Polarization",
        "Scene_Identifier": "2526_2526_2299_24",
        "Scene_Identifier_Scheme": "DumpingOrbit_ImagingOrbit_StripID_SceneNo"
      },
      "stac_version": "1.0.0",
      "stac_extensions": [ … ] // 2 items
    },
```

Thank You

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&
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