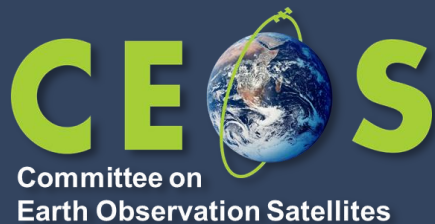




# ISRO STAC & STAC API Overview



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**Agenda Item 5.4**  
**WGISS-58**

**16-17 October 2024**

**Sioux Falls, South Dakota, USA**

*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.

- ✓ 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

## STAC Specification

### Item

A single spatiotemporal asset as a GeoJSON feature plus datetime and asset links

### Collection

Provides additional information about a spatio-temporal collection of data such as the extents, license, keywords, providers, etc.

### API





A RESTful endpoint that enables search of STAC Items, specified in OpenAPI, following OGC's WFS 3.

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 collections
-  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.

Grid of 12 collection cards:

- EOS-04\_SAR-MRS\_L2B**  
Bhoonidhi EOS-04\_SAR-MRS\_L2B Collection  
3/23/2022, 12:00:00 AM UTC - 2/27/2024, 12:00:00 AM UTC
- EOS-06\_OCM-GAC\_L2C-NDVI**  
Bhoonidhi EOS-06\_OCM-GAC\_L2C-NDVI Collection  
4/1/2023, 12:00:00 AM UTC - 3/29/2024, 12:00:00 AM UTC
- EOS-06\_OCM-LAC\_DA\_8day\_500m**  
Bhoonidhi EOS-06\_OCM-LAC\_DA\_8day\_500m Collection  
4/1/2023, 12:00:00 AM UTC - 3/19/2024, 12:00:00 AM UTC
- EOS-06\_OCM-LAC\_TSM\_8day\_500m**  
Bhoonidhi EOS-06\_OCM-LAC\_TSM\_8day\_500m Collection  
4/1/2023, 12:00:00 AM UTC - 3/19/2024, 12:00:00 AM UTC
- EOS-04\_SAR-MRS\_SM**  
Bhoonidhi EOS-04\_SAR-MRS\_SM Collection  
11/7/2023, 12:00:00 AM UTC - 2/27/2024, 12:00:00 AM UTC
- EOS-06\_OCM-GAC\_L2C-RRS**  
Bhoonidhi EOS-06\_OCM-GAC\_L2C-RRS Collection  
4/1/2023, 12:00:00 AM UTC - 3/29/2024, 12:00:00 AM UTC
- EOS-06\_OCM-LAC\_L1C**  
Bhoonidhi EOS-06\_OCM-LAC\_L1C Collection  
4/1/2023, 12:00:00 AM UTC - 2/27/2024, 12:00:00 AM UTC
- ResourceSat-2\_LISS4-MX70\_L2**  
Bhoonidhi ResourceSat-2\_LISS4-MX70\_L2 Collection  
5/8/2011, 12:00:00 AM UTC - 4/16/2024, 12:00:00 AM UTC
- EOS-06\_OCM-GAC\_AOD\_8day\_4km**  
Bhoonidhi EOS-06\_OCM-GAC\_AOD\_8day\_4km Collection  
4/1/2023, 12:00:00 AM UTC - 3/19/2024, 12:00:00 AM UTC
- EOS-06\_OCM-GAC\_L2C-TSM**  
Bhoonidhi EOS-06\_OCM-GAC\_L2C-TSM Collection  
4/1/2023, 12:00:00 AM UTC - 3/1/2024, 12:00:00 AM UTC
- EOS-06\_OCM-LAC\_L2C-AOD**  
Bhoonidhi EOS-06\_OCM-LAC\_L2C-AOD Collection  
4/1/2023, 12:00:00 AM UTC - 2/27/2024, 12:00:00 AM UTC
- EOS-06\_OCM-GAC\_Chlorophyll\_8day\_4km**  
Bhoonidhi EOS-06\_OCM-GAC\_Chlorophyll\_8day\_4km Collection  
4/1/2023, 12:00:00 AM UTC - 3/19/2024, 12:00:00 AM UTC
- EOS-06\_OCM-GAC\_L2C-VF**  
Bhoonidhi EOS-06\_OCM-GAC\_L2C-VF Collection  
4/1/2023, 12:00:00 AM UTC - 3/2/2024, 12:00:00 AM UTC
- EOS-06\_OCM-LAC\_L2C-CHL**  
Bhoonidhi EOS-06\_OCM-LAC\_L2C-CHL Collection  
4/1/2023, 12:00:00 AM UTC - 2/27/2024, 12:00:00 AM UTC

in stac-fastapi [Up](#) [Collection](#) [Browse](#) [Search](#)

## R2F15APR2024067404012400063SSANSTUC00GTDC

Map

Thumbnails

Leaflet | © OpenStreetMap contributors.

### Collection

**ResourceSat-2\_LISS4-MX70\_L2**  
Bhoonidhi ResourceSat-2\_LISS4-MX70\_L2 Collection  
5/8/2011, 12:00:00 AM UTC - 4/16/2024, 12:00:00 AM UTC

### Metadata

General	
LatLon	FMX
LatLon	- - 102.613582 - 14.448893 - 103.451251 - 14.455892 - 103.456187 - 13.722770 - - 102.621183 - 13.716140 - - 102.613582 - 14.448893
Sensor	LIS4
Quality	Unknown : 0
MetaData	<b>DATUM:</b> WGS84 <b>ROWNO:</b> 63 <b>LATLON:</b> POLYGON ((14.448893 102.613582,14.455892 103.451251,13.722770 103.456187,13.716140 102.621183,14.448893 102.613582))) <b>PATHNO:</b> 124 <b>SENSOR:</b> LIS4

### Assets

- data
- metadata
- XML
  - [Download](#) [Copy URL](#)
- thumbnail
- JPEG image
  - [Open](#) [Copy URL](#) [Show on map](#)

STAC Collections

STAC Browser

Layers

- E04\_SAR\_MRS\_19APR2024\_110011255051\_12020\_STUC00
- E04\_SAR\_MRS\_19APR2024\_12020\_15272\_11\_SAN\_STUC00
- E04\_SAR\_MRS\_19APR2024\_110011315427\_12020\_STUC00
- E04\_SAR\_MRS\_19APR2024\_12020\_15272\_12\_SAN\_STUC00
- E04\_SAR\_MRS\_19APR2024\_110011335807\_12020\_STUC00
- E04\_SAR\_MRS\_19APR2024\_12020\_15272\_13\_SAN\_STUC00
- E04\_SAR\_MRS\_19APR2024\_110011356190\_12020\_STUC00
- E04\_SAR\_MRS\_19APR2024\_12020\_15272\_14\_SAN\_STUC00
- E04\_SAR\_MRS\_19APR2024\_110011416577\_12020\_STUC00
- E04\_SAR\_MRS\_19APR2024\_12020\_15272\_15\_SAN\_STUC00
- E04\_SAR\_MRS\_19APR2024\_110011436967\_12020\_STUC00
- E04\_SAR\_MRS\_19APR2024\_12020\_15272\_16\_SAN\_STUC00
- E04\_SAR\_MRS\_19APR2024\_110011457359\_12020\_STUC00
- E04\_SAR\_MRS\_19APR2024\_12020\_15272\_17\_SAN\_STUC00
- E04\_SAR\_MRS\_19APR2024\_110011517755\_12020\_STUC00
- E04\_SAR\_MRS\_19APR2024\_12020\_15272\_18\_SAN\_STUC00
- E04\_SAR\_MRS\_19APR2024\_110011538152\_12020\_STUC00
- E04\_SAR\_MRS\_19APR2024\_12020\_15272\_19\_SAN\_STUC00
- E04\_SAR\_MRS\_19APR2024\_110011558553\_12020\_STUC00
- E04\_SAR\_MRS\_19APR2024\_12020\_15272\_20\_SAN\_STUC00

STAC API Browser

Search Results Settings

Filter

Displaying page 1 of results, 20 item(s)

**E04\_SAR\_MRS\_19APR2024\_12020\_15272\_20\_SAN\_STUC00ETD\_H\_HV\_D\_P**

Date acquired: 04/19/2024

Select footprint

**E04\_SAR\_MRS\_19APR2024\_110011558553\_12020\_STUC00ZTD\_15272\_20\_DH\_D**

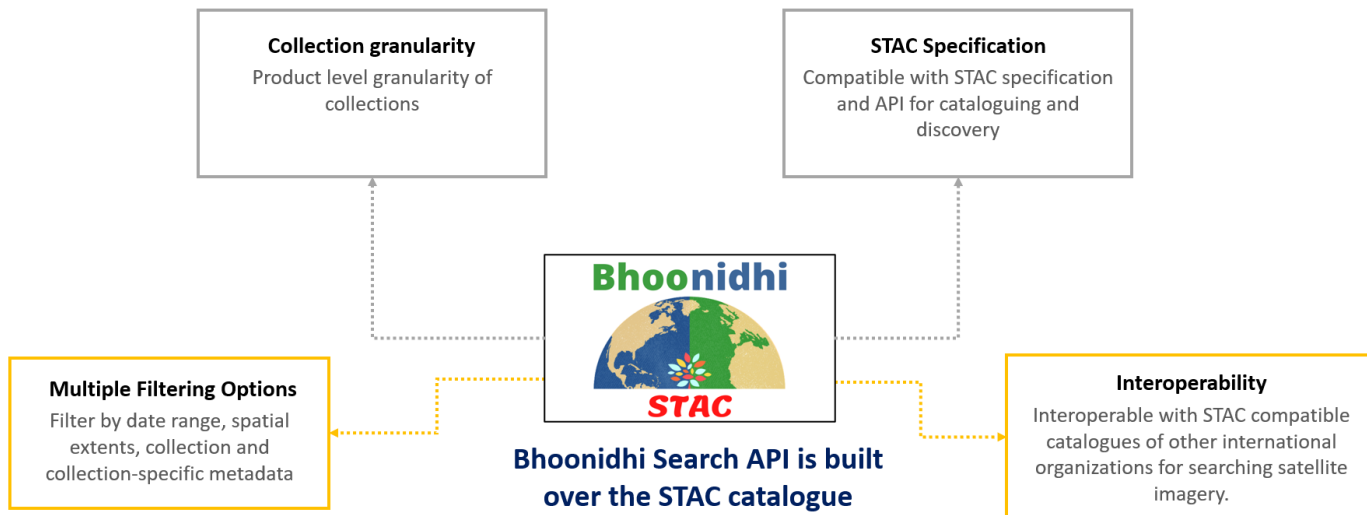
Assets

Item E04\_SAR\_MRS\_19APR2024\_12020\_15272\_20\_SAN\_STUC00ETD\_H\_HV\_D\_P  
3 available asset(s)

Name	Type	<input type="checkbox"/> Select to add as a layer	<input type="checkbox"/> Select to download
data	application/octet-stream	<input type="checkbox"/>	<input type="checkbox"/>
metadata	text/xml	<input type="checkbox"/>	<input type="checkbox"/>
thumbnail	image/jpeg	<input type="checkbox"/>	<input type="checkbox"/>

*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.*

## Bhoonidhi API services



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



## 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 options 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.



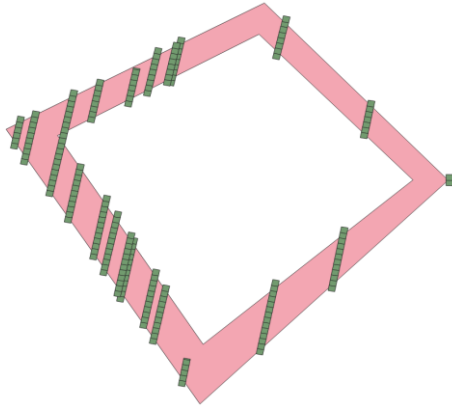
S.No	Field	Description	Format	Values
1	collections	Array of one or more Collection IDs	["col_id1", "col_id2"]	Above mentioned available collections
2	datetime	Date range	Single date+time, or a range ('Z' separator), formatted to <a href="#">RFC 3339, section 5.6</a>	'2023-11-02T00:00:00Z/2023-11-03T23:59:59Z'
3	filter	Conditions to filter the datasets	'args': [ {'property': 'property_name'}, 'property_value' ], 'op': 'condition'	'args': [ {'property': 'Polarization'}, 'DH' ], 'op': 'eq' Can be used to filter products available for direct download <a href="#">(see Examples)</a> <a href="#">(filter_by_online_status)</a>
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.

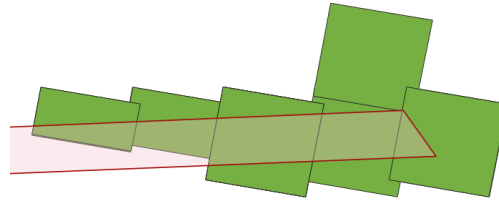
## Example Input JSON Object for aoi\_single\_polygon

```
{
  "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
}
```

## 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

Ms. Anupama Sharma, Mr.S.Muralikrishnan, Mr.Nitant Dube  
&  
Bhoonidhi Team

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