STAC

SpatioTemporal Asset Catalogs

and

Open-Source Software Supporting Open Science

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WHY??
What is it?

- JSON defined metadata for geospatial catalogs and assets
  - Focus on search and discovery
  - Simple and extensible
- Dynamic APIs
  - Searchable on arbitrary fields
- Static catalogs
  - Crawlable
What is it not?

- Full-fledged metadata standard
- Single source of truth
- Covering all kind of datasets
- Seriously - not a replacement for ISO 19115, OGC CSW, ...
The specification

- **Catalogs**
  - There’s always a root catalog
  - Contains other catalogs and collections

- **Collections**
  - Can contain other catalogs (called sub-catalogs) to group Items further
    - e.g., For Landsat-8 there might be sub-catalog by Landsat Path and Row
  - Ultimately contains Items which are similar in some way(s)
    - e.g., same instrument, same region containing data from different instruments, etc.

- **Items**
  - A single scene or set of datafiles for a specific location at a specific date and time (when and where)
STAC Ecosystem

https://github.com/radiantearth/stac-spec/blob/master/implementations.md
```json
1 {
2   "type": "Feature",
3   "id": "LC80190232015097LGN00",
4   "geometry": {
5     "type": "Polygon",
6     "coordinates": [
7       [
8         [-76.61570759444504, 52.43864121143704],
9       [-76.6585808927941, 52.35408793014861],
10       [-76.73673489501518, 52.19995522778887]
11     ],
12   ]
13 }
14 }
```
Planet Disaster Data (planet-disaster-data)

Version 1.0.0

⚠️ https://storage.googleapis.com/pdd-stac/disasters/catalog.json

Planet Disaster Data makes imagery available directly to the public, volunteers, humanitarian organizations, and other coordinating bodies in support of the International Charter for Space and Major Disasters. Data is released for individual disaster events, providing a 30 day window pre- and post-disaster. Imagery is provided under Creative Commons licenses, free of charge, with either CC-BY-SA or CC-BY-NC.

Catalogs

<table>
<thead>
<tr>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hurricane Harvey</td>
</tr>
</tbody>
</table>

Provider

- Planet Disaster Team <disaster-team@planet.com> (producer, licensor)

<table>
<thead>
<tr>
<th>STAC</th>
<th>0.6.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Version</td>
<td></td>
</tr>
</tbody>
</table>

Keywords: disaster, open

License: CC-BY-SA-4.0

Temporal: 8/28/2017, 11:00:00
Extent: AM - now

https://github.com/radiantearth/stac-browser
https://github.com/kbgg/qgis-stac-browser
Going Deeper...
sat-utils

https://github.com/sat-utils
sat-api

https://github.com/sat-utils/sat-api

- STAC dynamic API reference implementation
- Node library for a (STAC) API
- Deploy your own API:
  - https://github.com/sat-utils/sat-api-deployment
- Crawl existing static STAC catalogs to index
- Keep up to date by subscribing to STAC SNS topics
Earth Search

https://earth-search.aws.element84.com/stac

Public Search and Discovery API for Earth on AWS Datasets

- Central search catalog and standardized metadata
- Single API that allows searching of STAC metadata for all Earth on AWS datasets
- Powered by sat-api ([https://github.com/sat-utils/sat-api](https://github.com/sat-utils/sat-api))
- Backed by an ElasticSearch index
- Initial datasets:
  - Sentinel-2
  - CBERS-4
  - Landsat-8

Landsat-8
Landsat is perhaps one of the most oft-cited and used EO datasets because of its historical archive (Landsat-8 was launched in 2013, but the entire Landsat archive goes back to 1982, with some caveats).
CMR STAC API

API on top of NASA's Common Metadata Repository (CMR) that follows the exciting upcoming SpatioTemporal Asset Catalog (STAC) and Web Feature Service 3.0 (WFS) specifications.

We saw that these developing APIs are going to make geospatial data easier to access for everyone with the simplicity REST + JSON. Connecting these specifications with the CMR exposes thousands of collections with 300M+ granules of NASA data through an easy to use API.

We're excited about the future of these APIs and improving geospatial data access and usability. Contact us to find out more and make suggestions.

CHECK OUT CMR STAC API
Creating STAC Metadata
sat-stac

https://github.com/sat-utils/sat-stac

- Python library for creating or working with STAC catalogs, collections, and items
- Used for creating existing catalogs, such as
  - https://landsat.stac.cloud
  - https://sentinel.stac.cloud
  - http://cbers.stac.cloud/
- See the Jupyter Notebook tutorials
sat-stac-sentinel

https://github.com/sat-utils/sat-stac-sentinel

- Sentinel-2(a/b), Sentinel-1 coming
- Index Sentinel scenes on AWS
- Transform Sentinel metadata to STAC (tileInfo.json -> STAC)
- Deployed Lambda function for real-time publishing new Sentinel scenes as STAC
Using STAC and Cloud Optimized Data
sat-search

https://github.com/sat-utils/sat-search

- Python library for searching STAC complaint endpoints
- Command Line Interface (CLI) as a general purpose tool
- Save search results to be loaded and used later
- Download specific assets from all items
- Specify specific band colors to download those bands
  - e.g., Download all “red” and “nir” bands from these Landsat and Sentinel Items
$ sat-search search --intersects maine.geojson --found
1674 items found
$ clear
sat-fetch

https://github.com/sat-utils/sat-fetch

- Works just like sat-search, plus...
- Option to fetch imagery for just AOIs, rather than the entire asset
- Requires GDAL, or use publicly available Docker image
Ngorongoro crater: landsat-8 and sentinel-2
$ time sat-fetch load landsat-scenes.geojson \  
--download red green blue 
real 0m59.674s
$ time sat-fetch load sentinel-scenes.geojson \
   --download red green blue
real 8m6.525s
How can you be part of this?

If you’re an end user:
• Use the tools – provide feedback!
• Use STAC metadata – provide feedback!

If you’re an expert in a data type:
• Provide input on the extensions
• If we don’t have an extension for it, help write it

If you’re a data provider:
• Surface STAC metadata, reach out to someone hosting a catalog and index your data
• Make STAC relevant parameters available in your native metadata
• Consider cloud optimized representations of your data
Join STAC Sprint #5 + OGC API — Features hackathon November 5–7

**tl;dr:** Signup for the Joint STAC + OGC API Sprint, taking place November 5–7 at the IQT CosmiQ Works office in Arlington, VA. Virtual participants and new community members welcome!

**The longer version**

The past couple of years has seen some major steps forward on geospatial interoperability. The trend in OGC towards open collaboration, JSON + REST focus, and OpenAPI specs that started with WFS 3 is sweeping...
Thank you

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