



WORKSHOP

13. - 16. June 2022

Prague, Czech Republic



Co-financed by the Connecting Europe
Facility of the European Union



TERRASIGNA™

Using SpatioTemporal Asset Catalog (STAC) in Python

Jun 14, 2021: 09:00 - 10:30

<https://bit.ly/3xILlzs>



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Using STAC in Python - Outline

- Introduction to Cloud-Optimized GeoTIFF (COG)
- SpatioTemporal Asset Catalog (STAC)
- ODSE STAC solution
- Hands-on

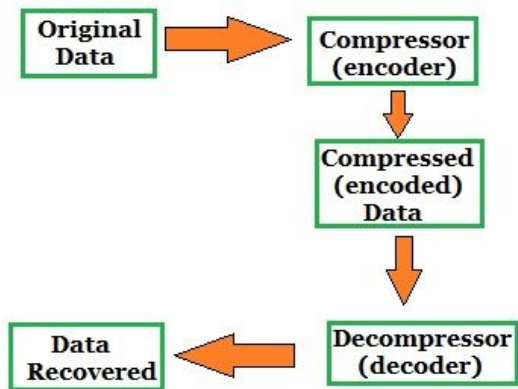
Introduction to Cloud-Optimized GeoTIFF (COG)

A COG is a regular GeoTIFF file, aimed at being hosted on a HTTP file server, with an internal organization that enables more efficient workflows on the cloud.

Source: [Cloud Optimized GeoTIFF in depth](#) and [Guo et al., 2016](#)

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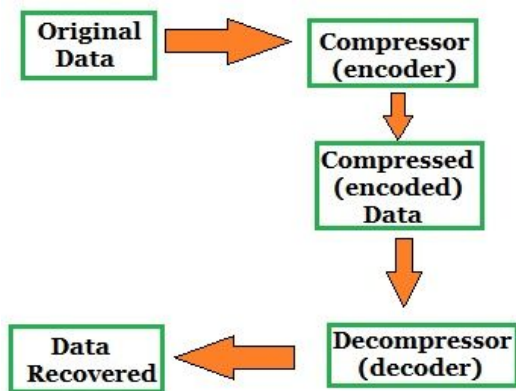


Lossless compression
(DEFLATE, LZW)

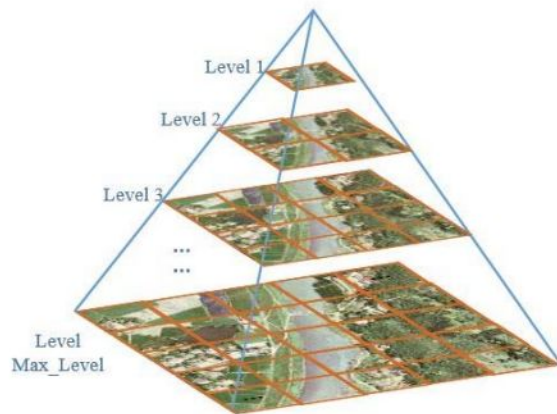
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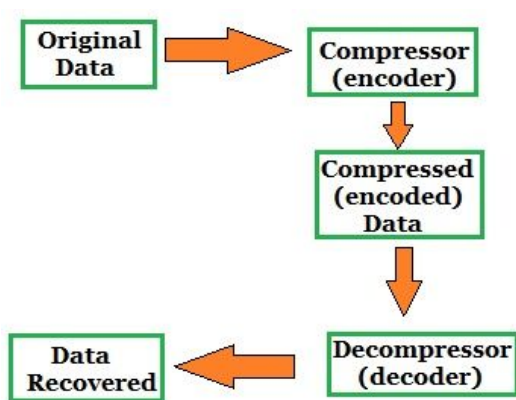


Tiling and overviews
(pyramid structure)

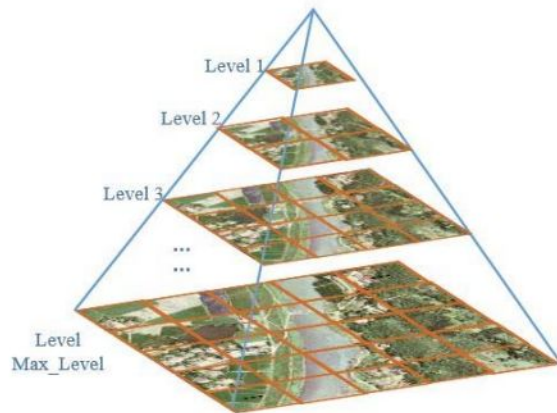
Source: [Cloud Optimized GeoTIFF in depth](#) and [Guo et al., 2016](#)

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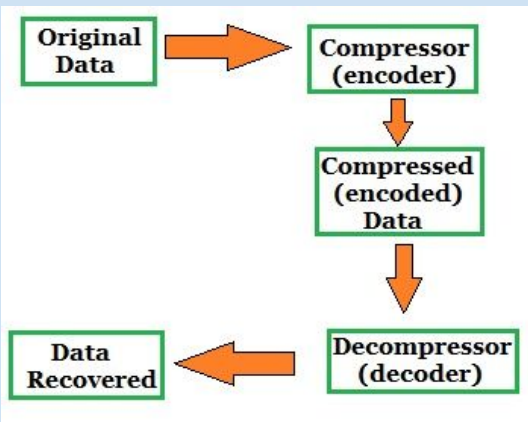


HTTP Get Range requests
(Accept-Ranges: bytes)

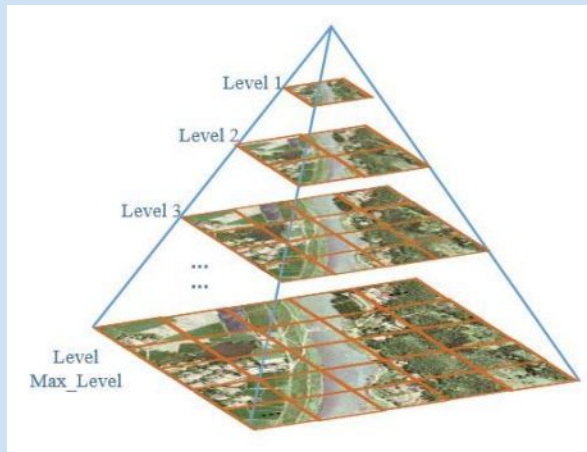
Source: [Cloud Optimized GeoTIFF in depth](#) and [Guo et al., 2016](#)

Introduction to Cloud-Optimized GeoTIFF (COG)

Cloud Object Storage



Lossless compression
(DEFLATE, LZW)



Tiling and overviews
(pyramid structure)



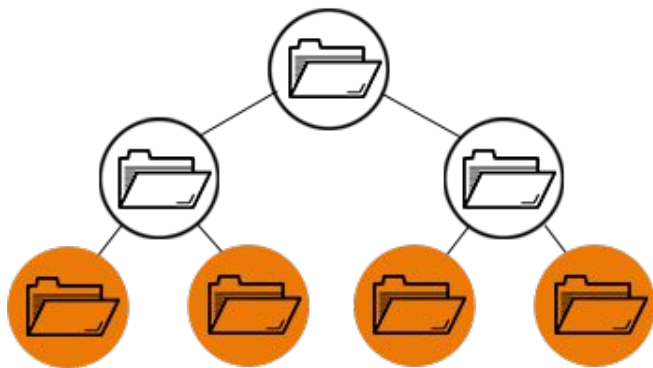
HTTP Get Range requests
(Accept-Ranges: bytes)



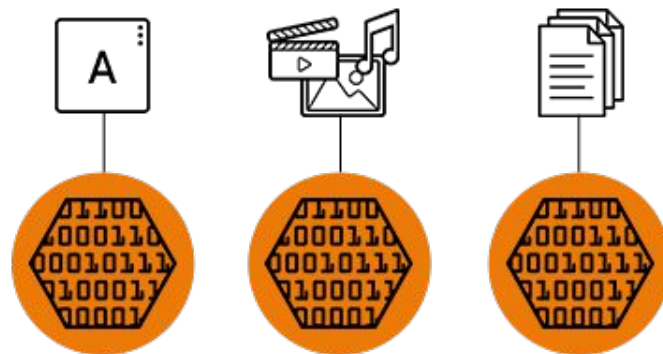
Source: [Cloud Optimized GeoTIFF in depth](#) and [Guo et al., 2016](#)

Introduction to Cloud-Optimized GeoTIFF (COG)

Object storage is a data storage architecture for large stores of **unstructured data**, which designates each piece of data as an **object**, keeps it in a separate storehouse, and bundles it with **metadata** and a **unique identifier** for easy access and retrieval.



File storage



Object Storage

Source: [What is object storage?](#) and [File storage, block storage, or object storage?](#)

Introduction to Cloud-Optimized GeoTIFF (COG)



[Landsat Cloud Optimized GeoTIFF
Data Format Control Book](#)



[Cloud Storage public datasets](#)



[Sentinel-2](#), [Landsat 8](#) and [CBERS](#)

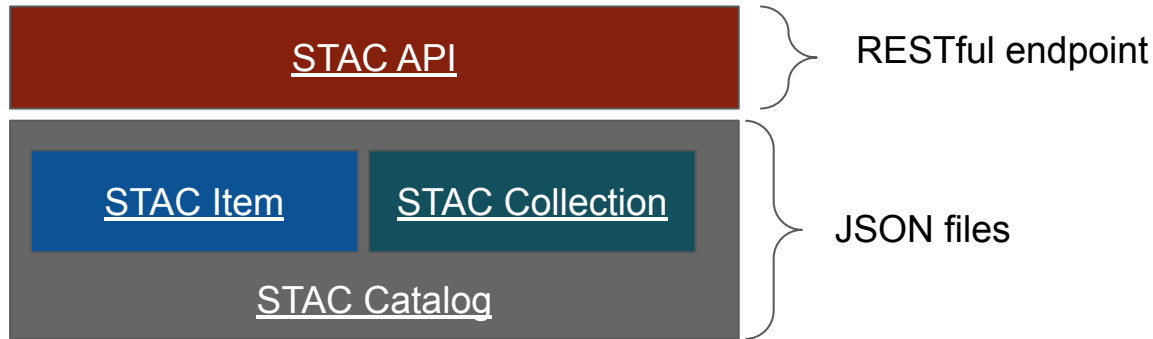
SpatioTemporal Asset Catalog (STAC)

- The STAC **specification** provides a **common language** to describe a range of geospatial information, so it can more easily be **indexed** and **discovered**,
- A *spatiotemporal asset* is any file that represents information about the earth captured in a certain space and time,
- The goal is for all providers of *spatiotemporal assets* (Imagery, SAR, Point Clouds, Data Cubes, Full Motion Video, etc) to expose their data as STAC.



Source: <https://stacspe.org>

STANDARDS & SPECIFICATIONS

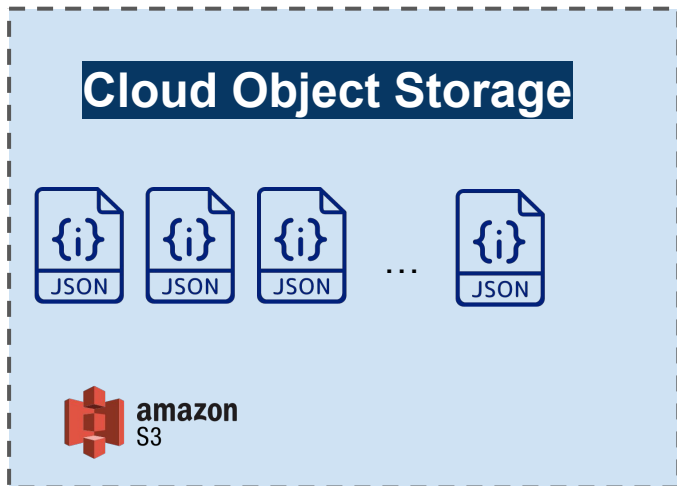


[STAC Best Practices](#)

Source: <https://stacspec.org>

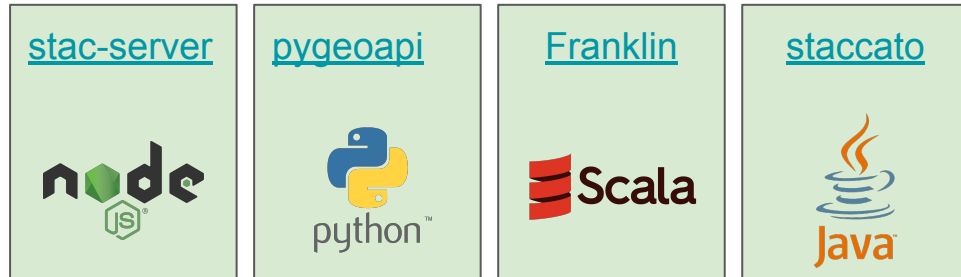
SpatioTemporal Asset Catalog (STAC)

Static Catalog



Dynamic Catalog

Application server



Source: [Static and Dynamic Catalogs](#)

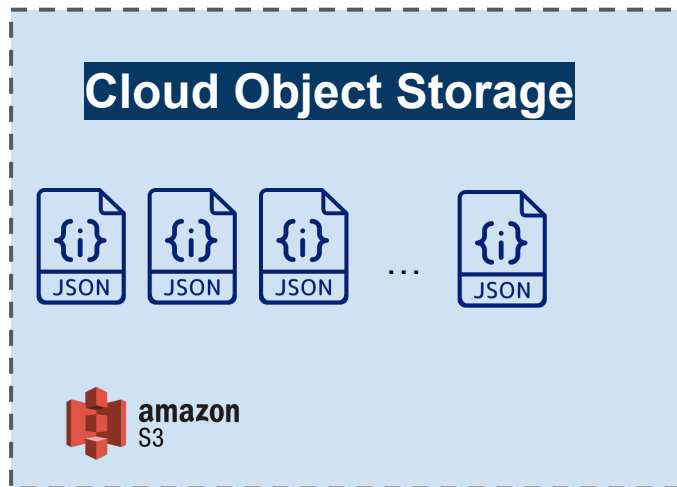
SpatioTemporal Asset Catalog (STAC)



Vue.js

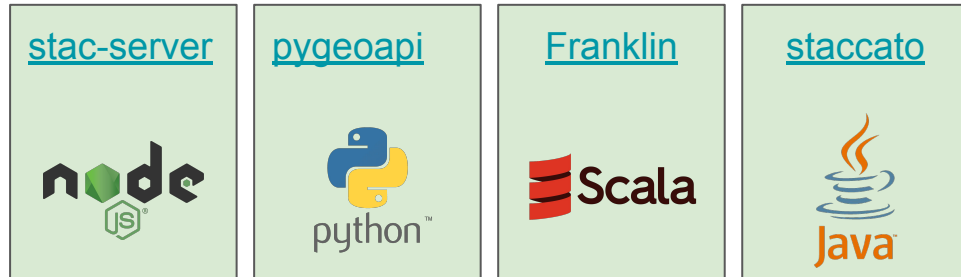
STAC Browser

Static Catalog



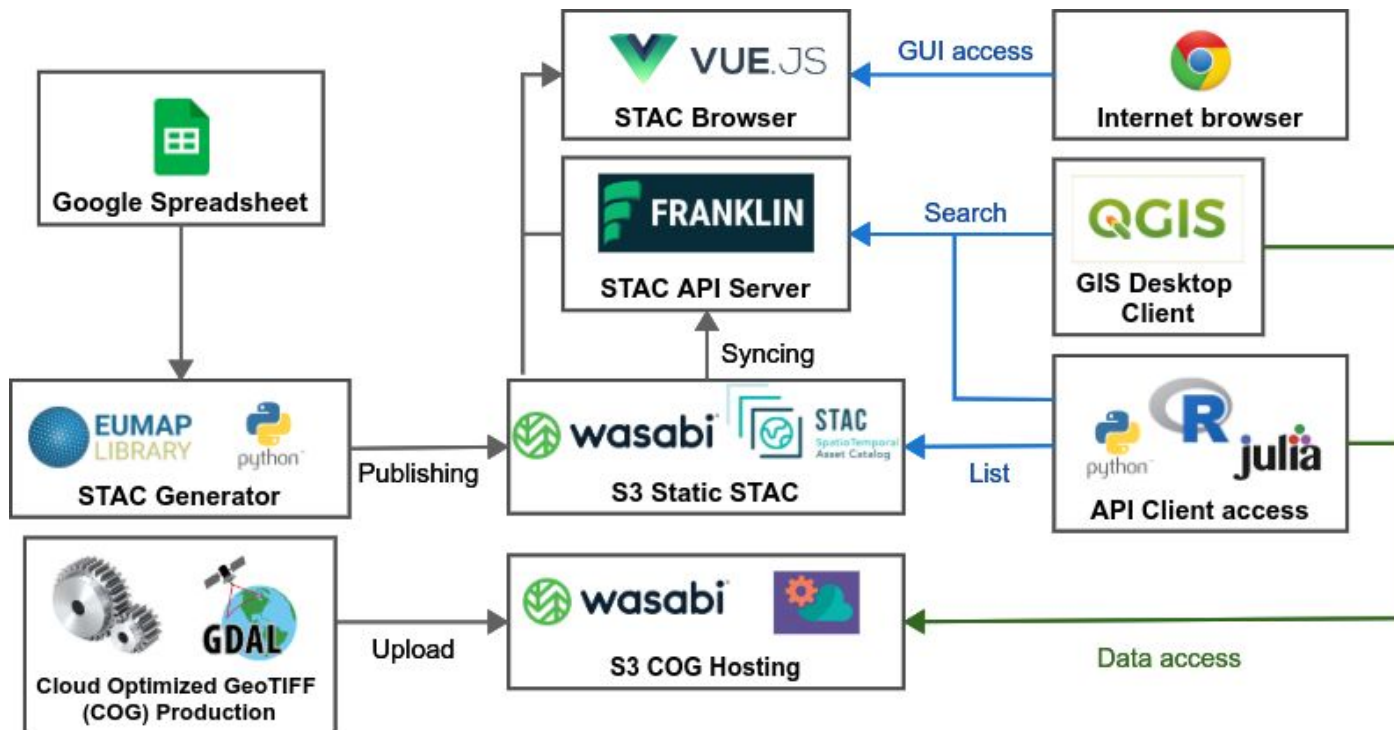
Dynamic Catalog

Application server



Source: [Static and Dynamic Catalogs](#)

ODSE STAC solution



[Metadata GSheet](#) and [EUMAP STAC Generator](#)

<http://stac.opendatascience.eu>

Catalogs

A list of STAC APIs and Static Catalogs.

Filter by Type

All

APIs

Static Catalogs

Filter by Access Level

All

Public only

Public & Protected only

Astraea Earth OnDemand

API Public

Astraea Earth OnDemand geospatial imagery query and analysis tool

<https://eod-catalog-svc-prod.astraea.earth/>

California Forest Observatory

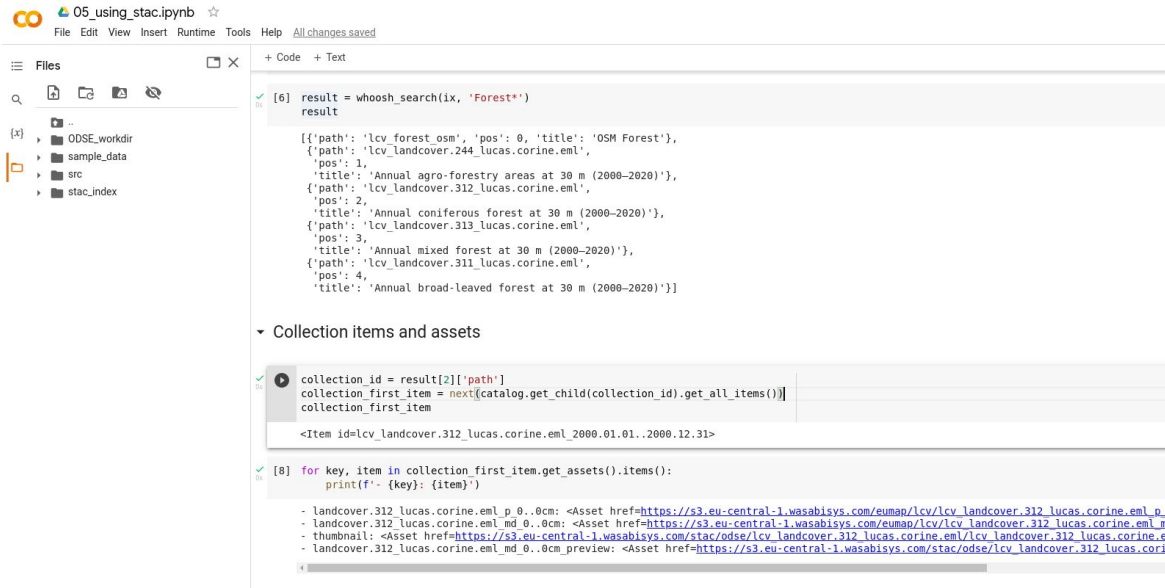
Catalog Public

The Forest Observatory is a data-driven forest monitoring system that maps the drivers of wildfire behavior across the state with a focus on vegetation fuels. Data are available for non-commercial use under the Forest Observatory [terms of use](#).

<https://storage.googleapis.com/cfo-public/catalog.json>

Hands-on

<https://colab.research.google.com/drive/1koysoqdWxabXFRiUw633erUjYd5QWVmn>



The screenshot shows a Jupyter Notebook titled "05_using_stac.ipynb". The left sidebar displays a file explorer with a directory structure: "ODSE_workdir", "sample_data", "src", and "stac_index". The main area contains two code cells. The first cell, labeled [6], executes a search query for "Forest" and returns a list of five STAC items. The second cell, labeled [8], iterates over the first item's assets and prints their details, including URLs for various map and thumbnail assets.

```
[6] result = whoosh_search(ix, 'Forest*')
result

[{'path': 'lcv_forest_osm', 'pos': 0, 'title': 'OSM Forest'},
 {'path': 'lcv_landcover.244_lucas.corine.eml',
  'pos': 1,
  'title': 'Annual agro-forestry areas at 30 m (2000-2020)'},
 {'path': 'lcv_landcover.312_lucas.corine.eml',
  'pos': 2,
  'title': 'Annual coniferous forest at 30 m (2000-2020)'},
 {'path': 'lcv_landcover.313_lucas.corine.eml',
  'pos': 3,
  'title': 'Annual mixed forest at 30 m (2000-2020)'},
 {'path': 'lcv_landcover.311_lucas.corine.eml',
  'pos': 4,
  'title': 'Annual broad-leaved forest at 30 m (2000-2020)'}]
```

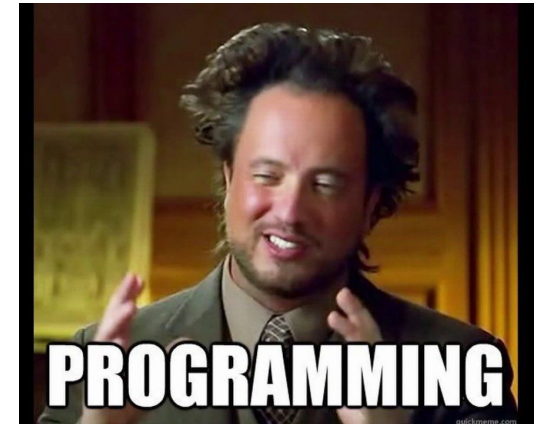
Collection items and assets

```
[7] collection_id = result[2]['path']
collection_first_item = next(catalog.get_child(collection_id).get_all_items())
collection_first_item

<Item id=lcv_landcover.312_lucas.corine.eml_2000.01.01..2000.12.31>
```

```
[8] for key, item in collection_first_item.get_assets().items():
    print(f'~ {key}: {item}')

- landcover.312_lucas.corine.eml p 0.0cm: <Asset href=https://s3.eu-central-1.wasabisys.com/eumap/lcv/lcv_landcover.312_lucas.corine.eml_p_3
- landcover.312_lucas.corine.eml_md 0.0cm: <Asset href=https://s3.eu-central-1.wasabisys.com/eumap/lcv/lcv_landcover.312_lucas.corine.eml_md
- thumbnail: <Asset href=https://s3.eu-central-1.wasabisys.com/stac/odse/lcv_landcover.312_lucas.corine.eml/lcv_landcover.312_lucas.corine.em
- landcover.312_lucas.corine.eml_md 0.0cm preview: <Asset href=https://s3.eu-central-1.wasabisys.com/stac/odse/lcv_landcover.312_lucas.corin
```





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