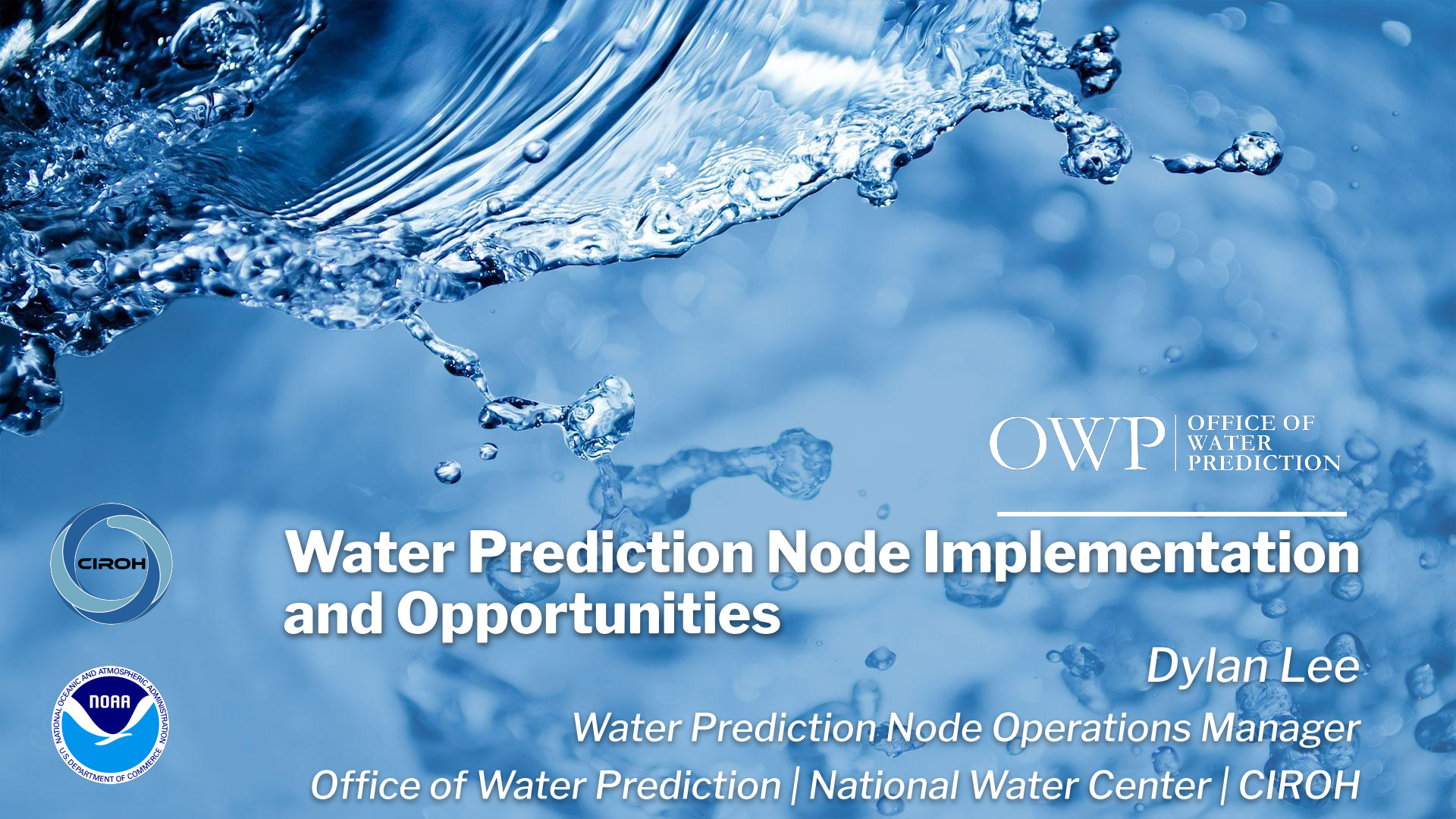

OWP | OFFICE OF WATER PREDICTION

Water Prediction Node Implementation and Opportunities

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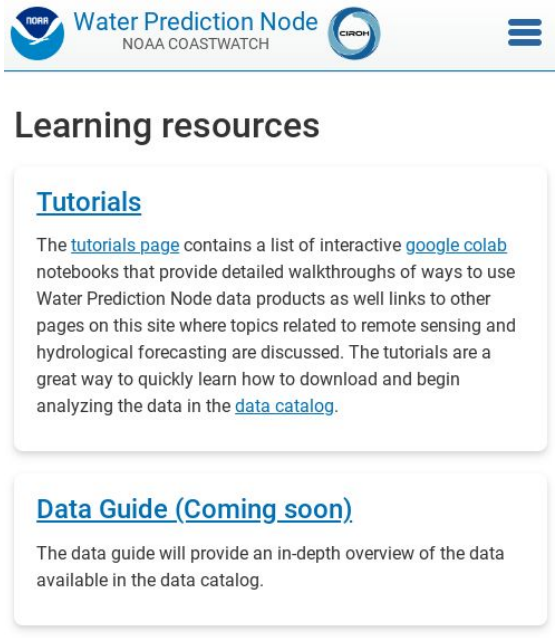
Office of Water Prediction | National Water Center | CIROH

Overview

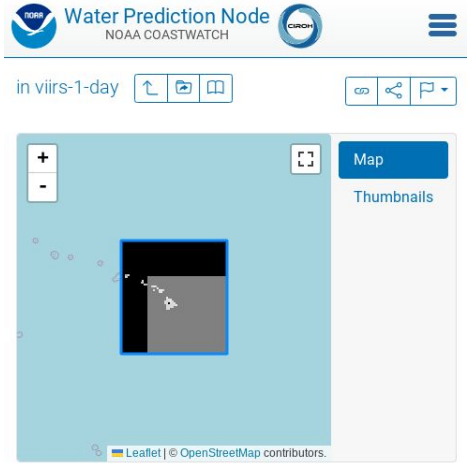
- WPN website
- WPN data catalog
- Enabling qualitative FIM evaluation
- Next steps

WPN services

Content

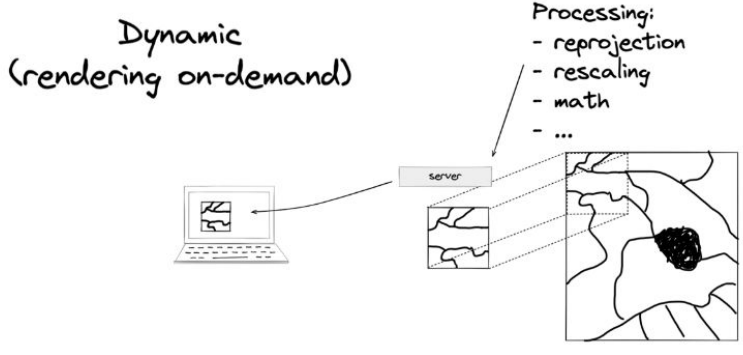


Data catalog



Data services

Web map tile serving:



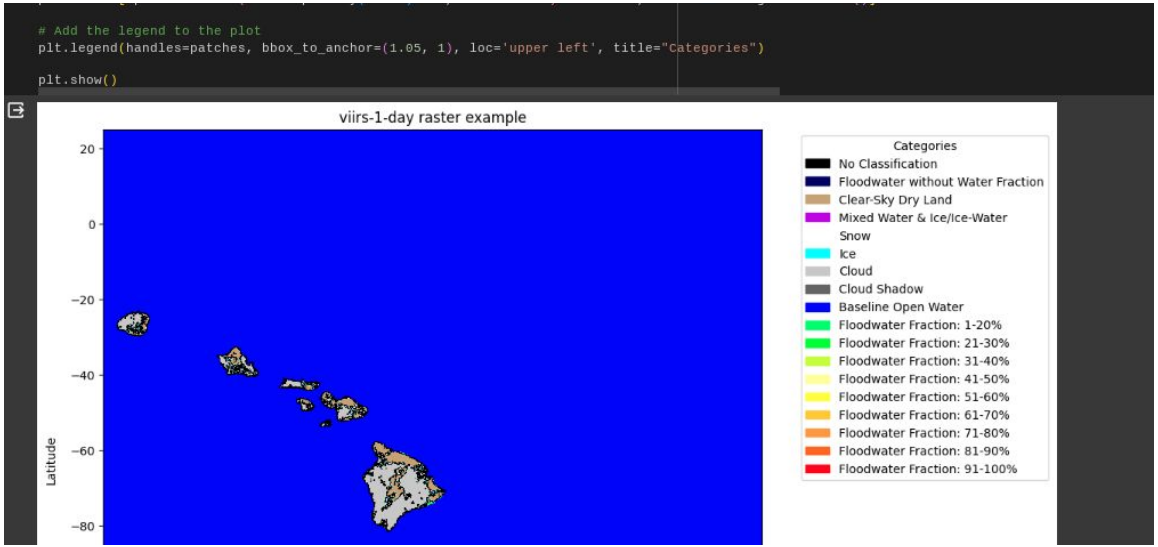
Tools:

```
In [4]: agreement_map.gval.cat_plot(title="Agreement Map")
```

WPN content

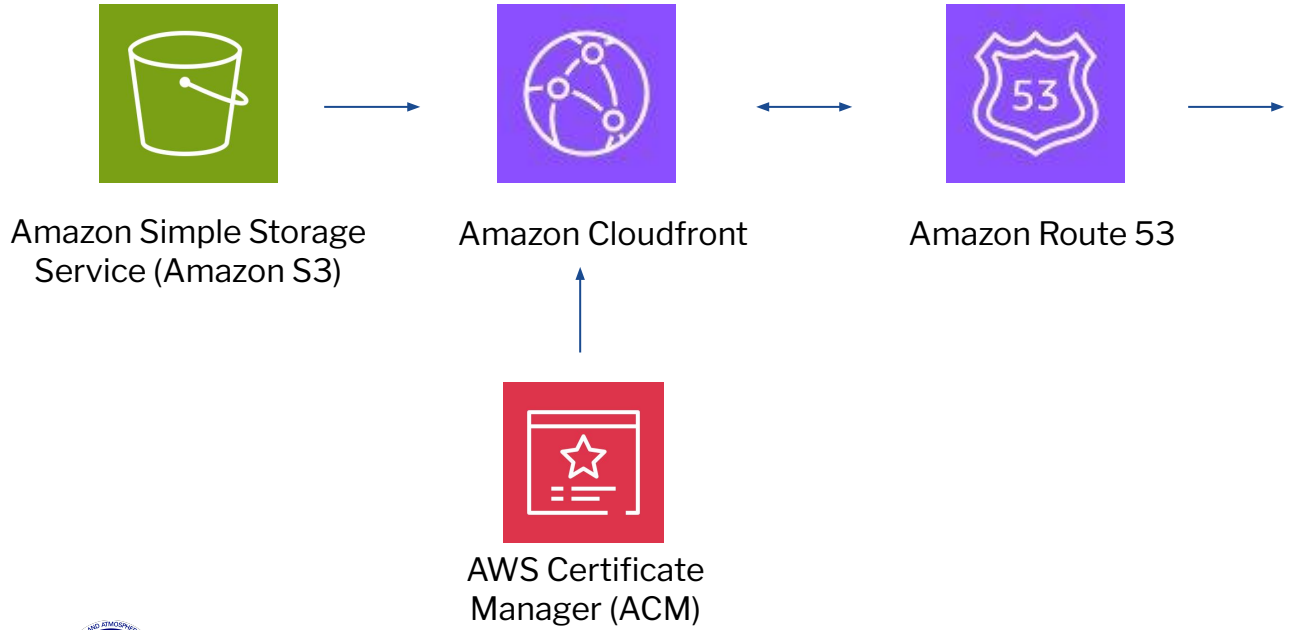
Downloading data from the data catalog

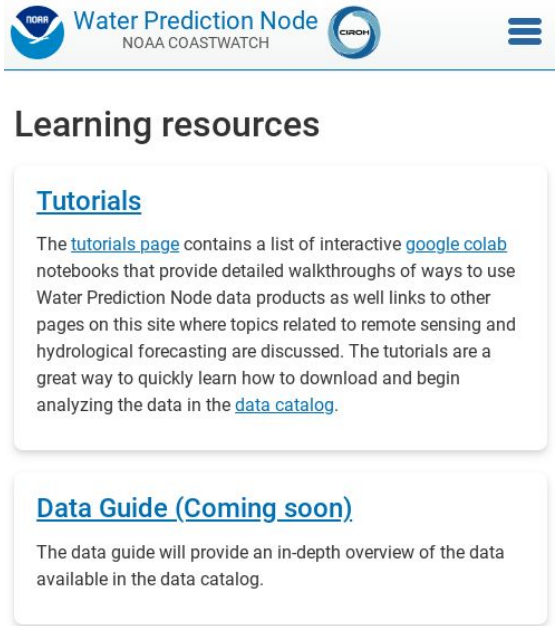
This is an interactive tutorial demonstrating how to search for, visualize, and download data from the Water Prediction Node data catalog using python.



Am currently working on a tutorial covering how USGS 3-DEP DEM are used in creating the flowlines for the NWM hydrofabric

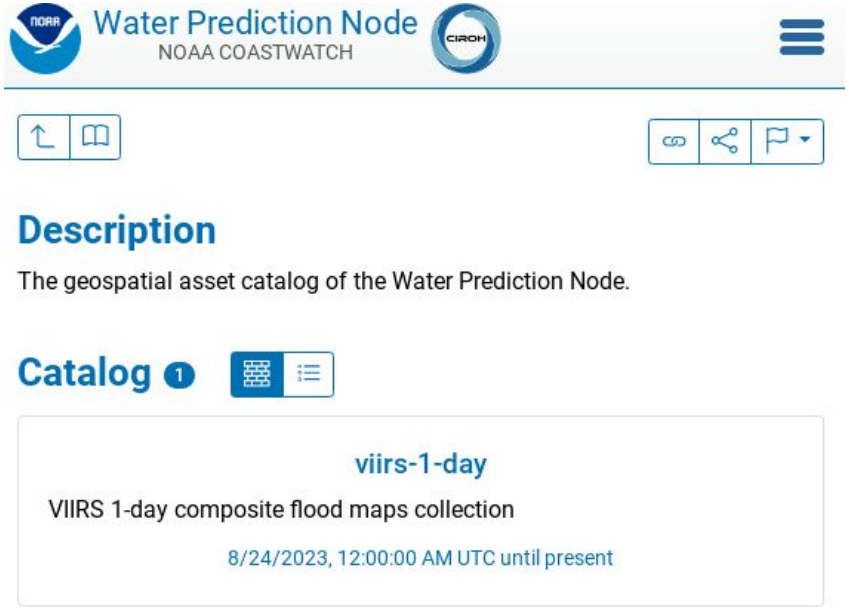
Hosting WPN content in 2024





Data catalog - design considerations

- Prioritize cloud native formats
  - Other formats can be created on the fly as needed or stored in archival storage
- Enable search and bulk download using python or R
- Have an reduced assurance, experimental catalog and a public catalog
- Attempt to pass-through data hosted elsewhere when appropriate
  - Filtering protocols can be put into place to only index relevant data

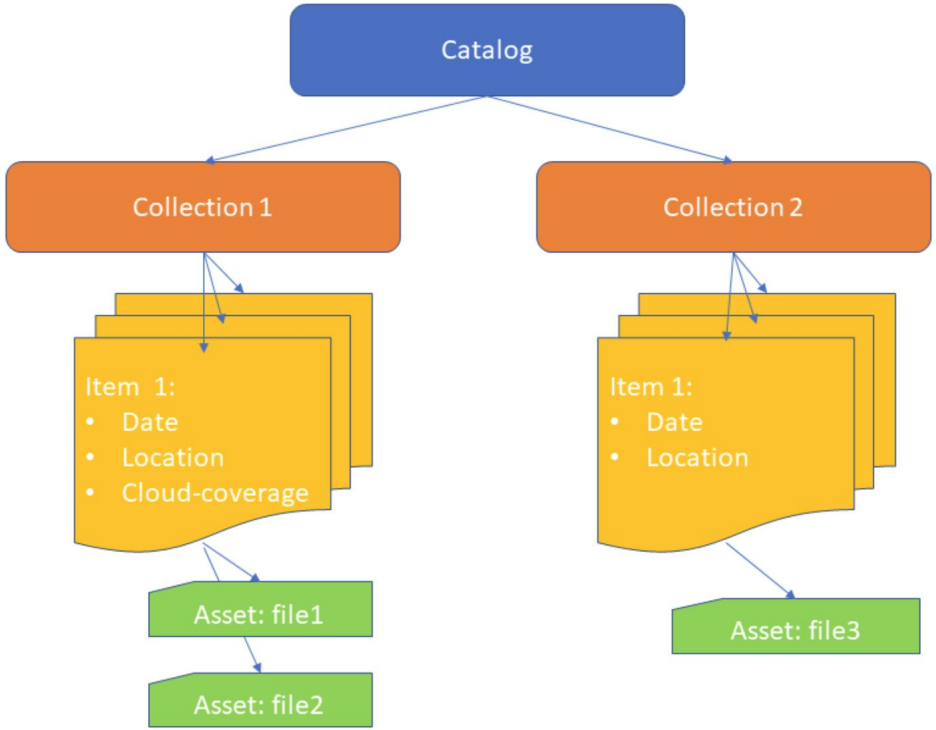


What is STAC

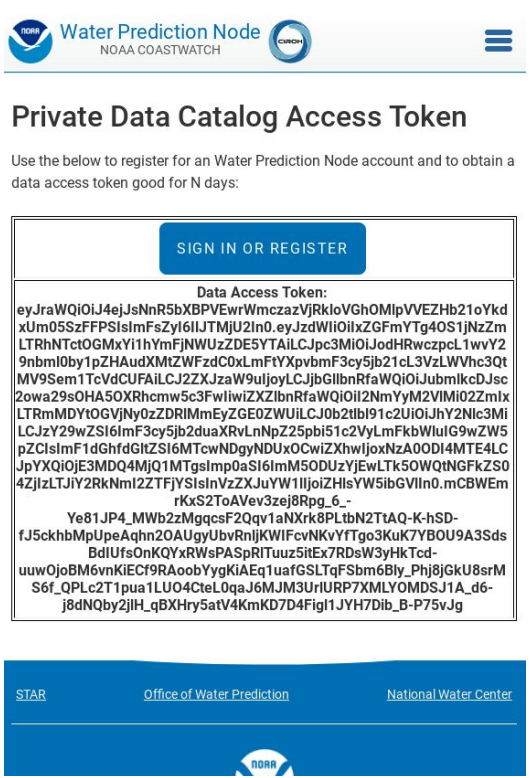
- STAC is a mature way of cataloging, searching, and interacting with geospatial data whose main goal is improving discoverability
- STAC already has many data providers that are exposing geospatial data via the STAC specification
  - Microsoft Planetary computer
  - ESA
  - USGS
- The STAC specification allows for a federated approach to sharing STAC items and assets similar to ERDDAP

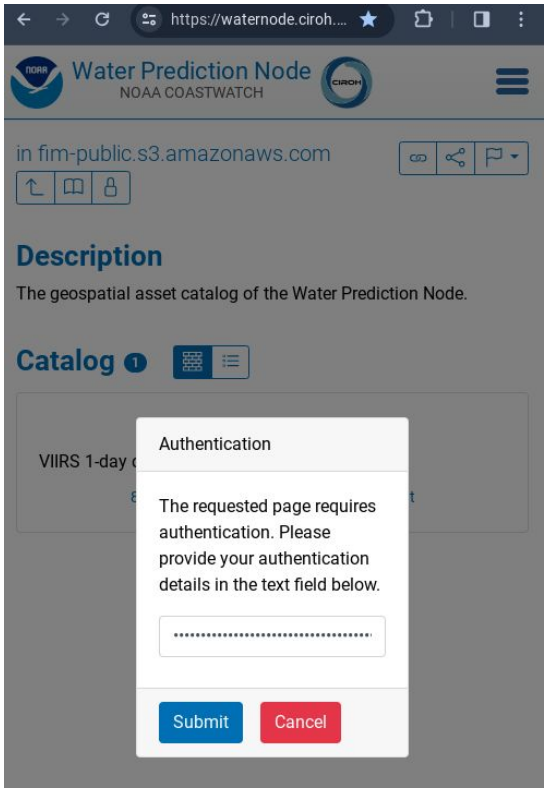
The structure of a STAC catalog

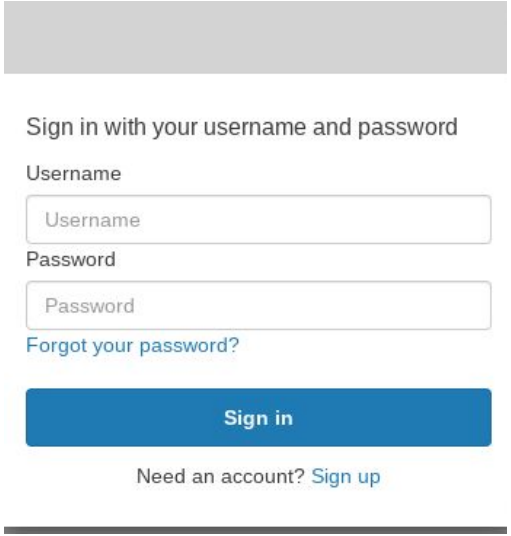
- Everything is a json object
- Catalogs are the top level object
- Catalogs can contain other catalogs or collections
- Collections contain items
- Assets in items are extremely flexible. Could be a tiff or netcdf file served by a request to a THREDDS or ERRDAP server
- Catalogs served by STAC servers become STAC API's capable of being dynamically searched



Experimental data catalog - authentication



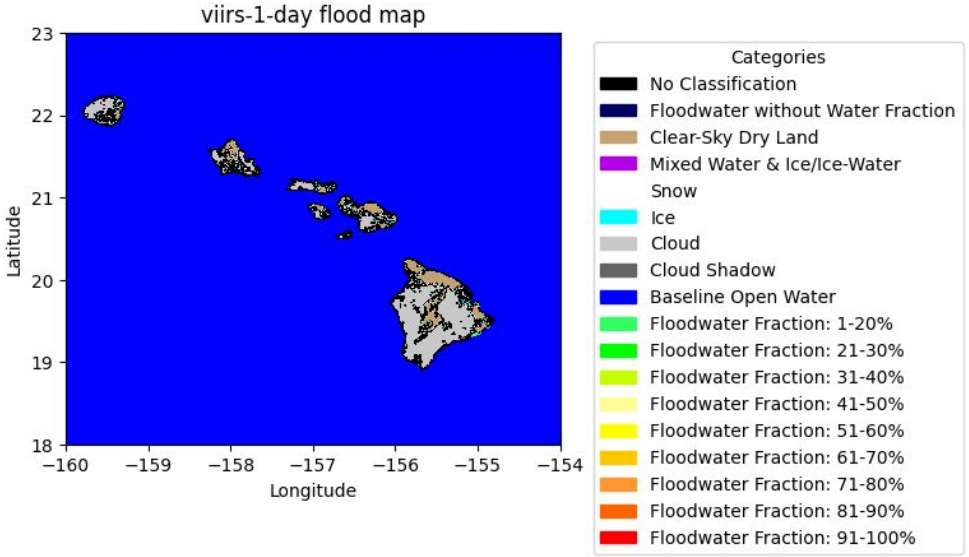




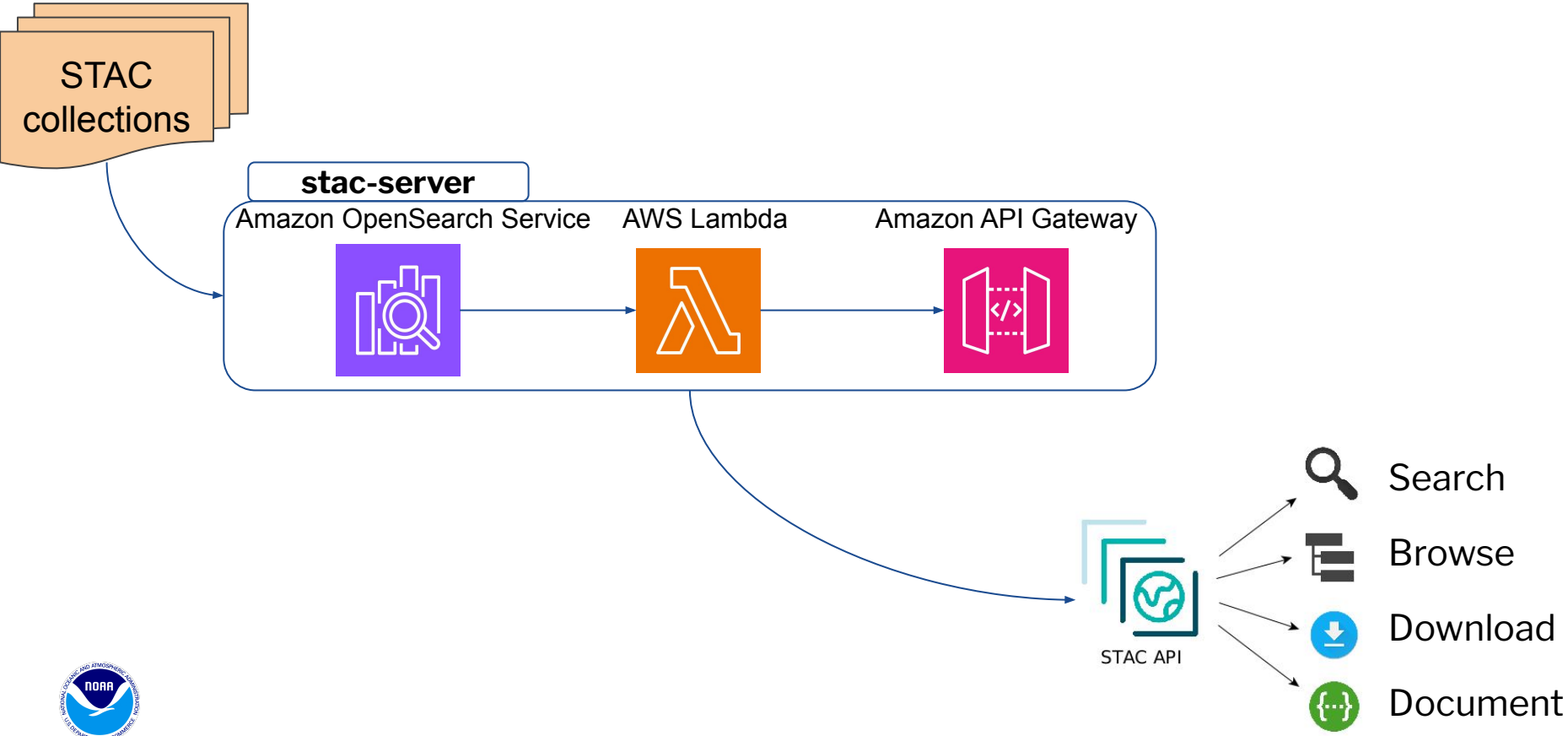
Authentication should be ready soon and will enable an experimental catalog.

WPN data catalog additions in 2024

- Expand archiving of STAR VIIRS and ABI flood maps
- Work with WPOD remote sensing and snow desk to upload their remote sensing products
    - Baseline inundated extents
    - SAR flood maps
    - River ice
- STAR soil moisture (SMOP)
- STAR vegetation indices (NDVI and vegetation condition index)

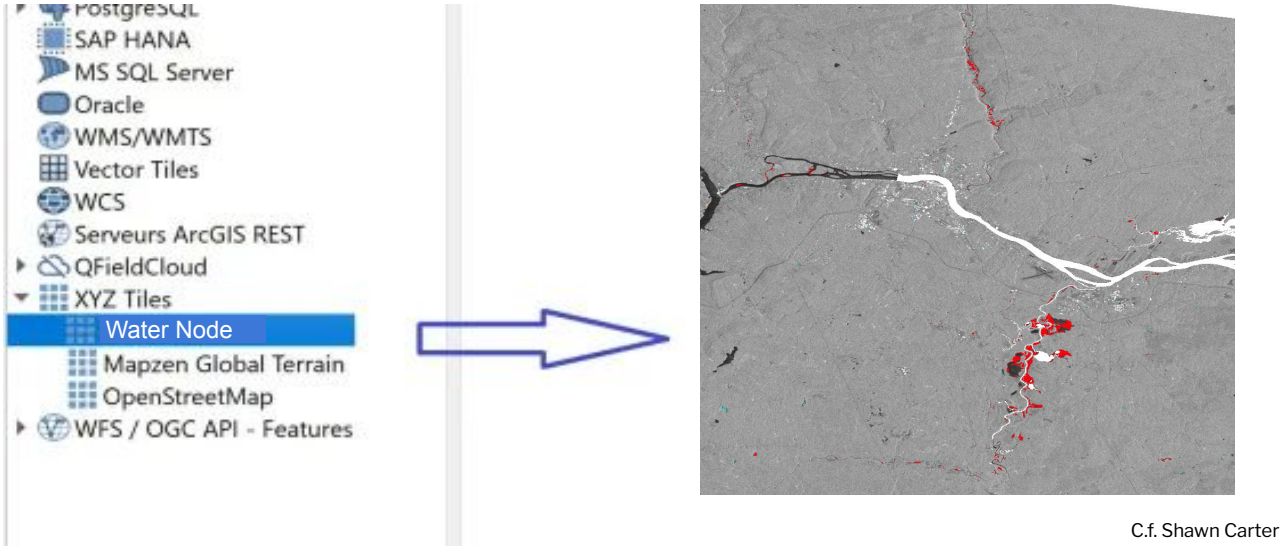


WPN data catalog architecture in 2024



Qualitative FIM evaluation

Qualitative FIM evaluation - raster tile serving



C.f. Shawn Carter

A web map tile service providing easy import of remotely sensed flood map layers into GIS software being used by FIM modelers is the first step

Flood map comparison layer using raster agreement maps

No water

Modeled water

SAR water

Both water

$$pair(x, y) = z$$

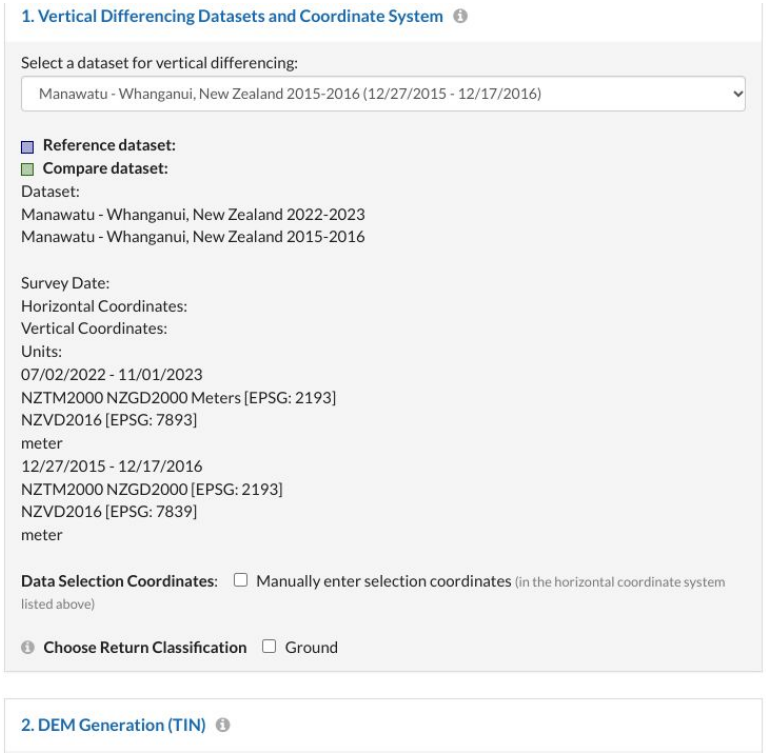
$$szudzik(x, y) = \begin{cases} x^2 + x + y, & \text{if } x \geq y \\ y^2 + x, & \text{otherwise} \end{cases}$$

Benchmark	Candidate	Agreement
1	0	2
1	2	5
2	0	6
2	2	8

Flood agreement map creation as a Water Prediction Node tool

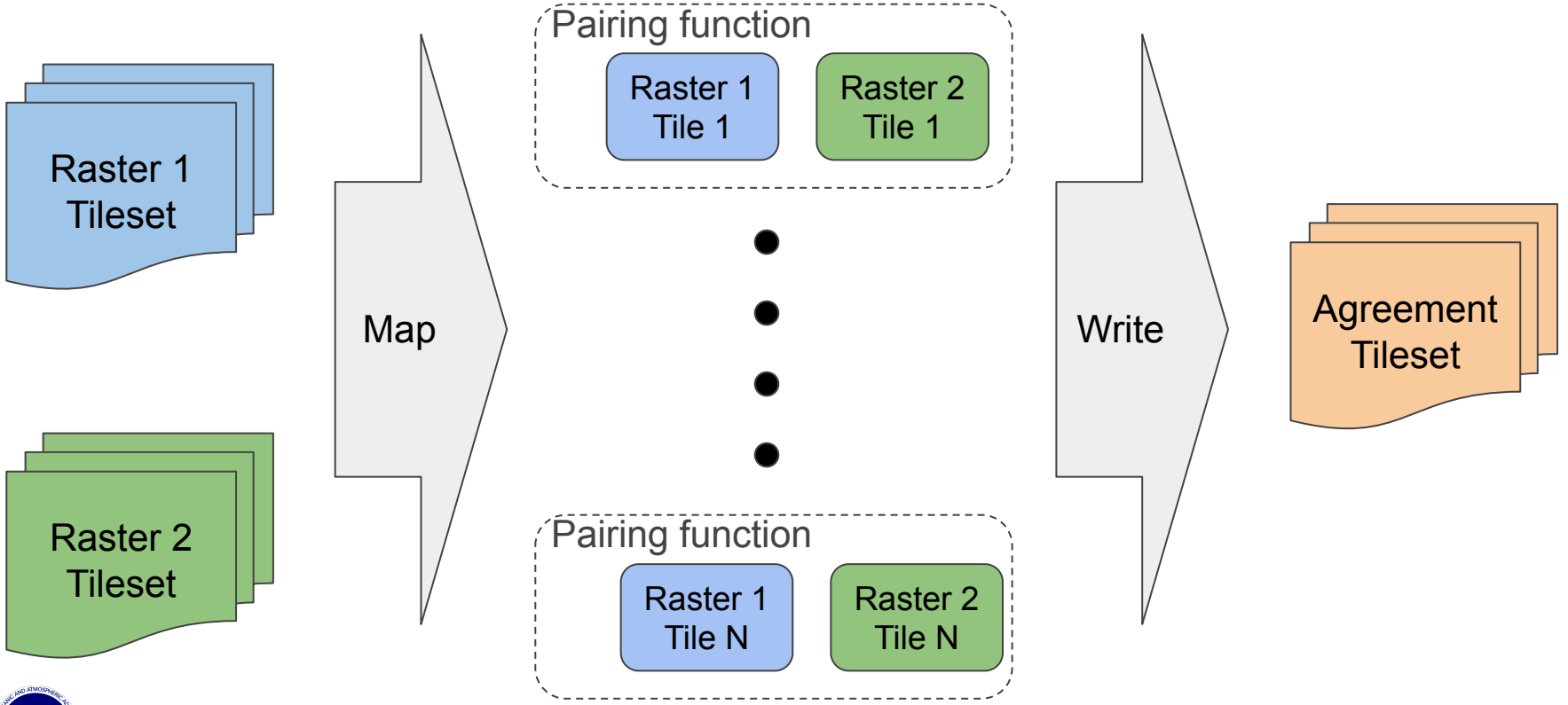
Inspired by:

OpenTopography's DEM differencing tool

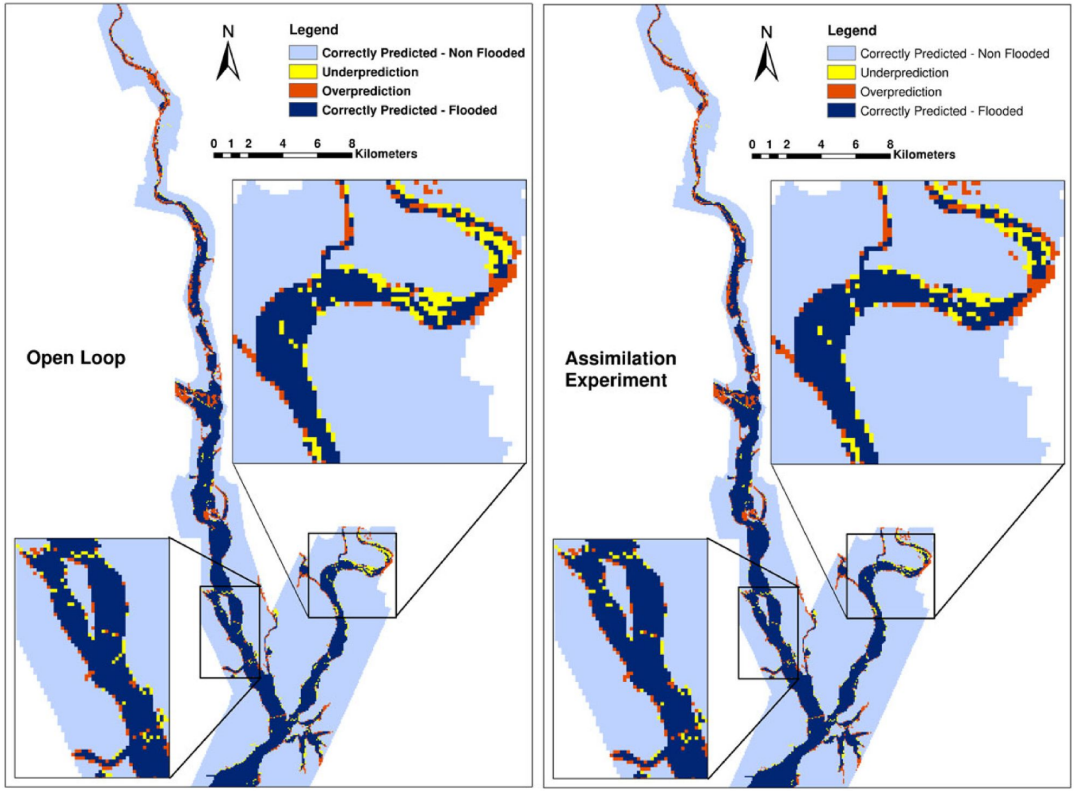


- User would input link to flood map in catalog
- HAND FIM maps would be generated using NWM discharges at time of flood map observation
- Agreement map would be computed and then automatically added to catalog along with NWM discharge files
- For larger streams, SWOT discharge estimates could also be used to provide an independent discharge to compare whole NWM FIM workflow against

Parallelizing agreement map creation



Next step: quantitative FIM evaluation

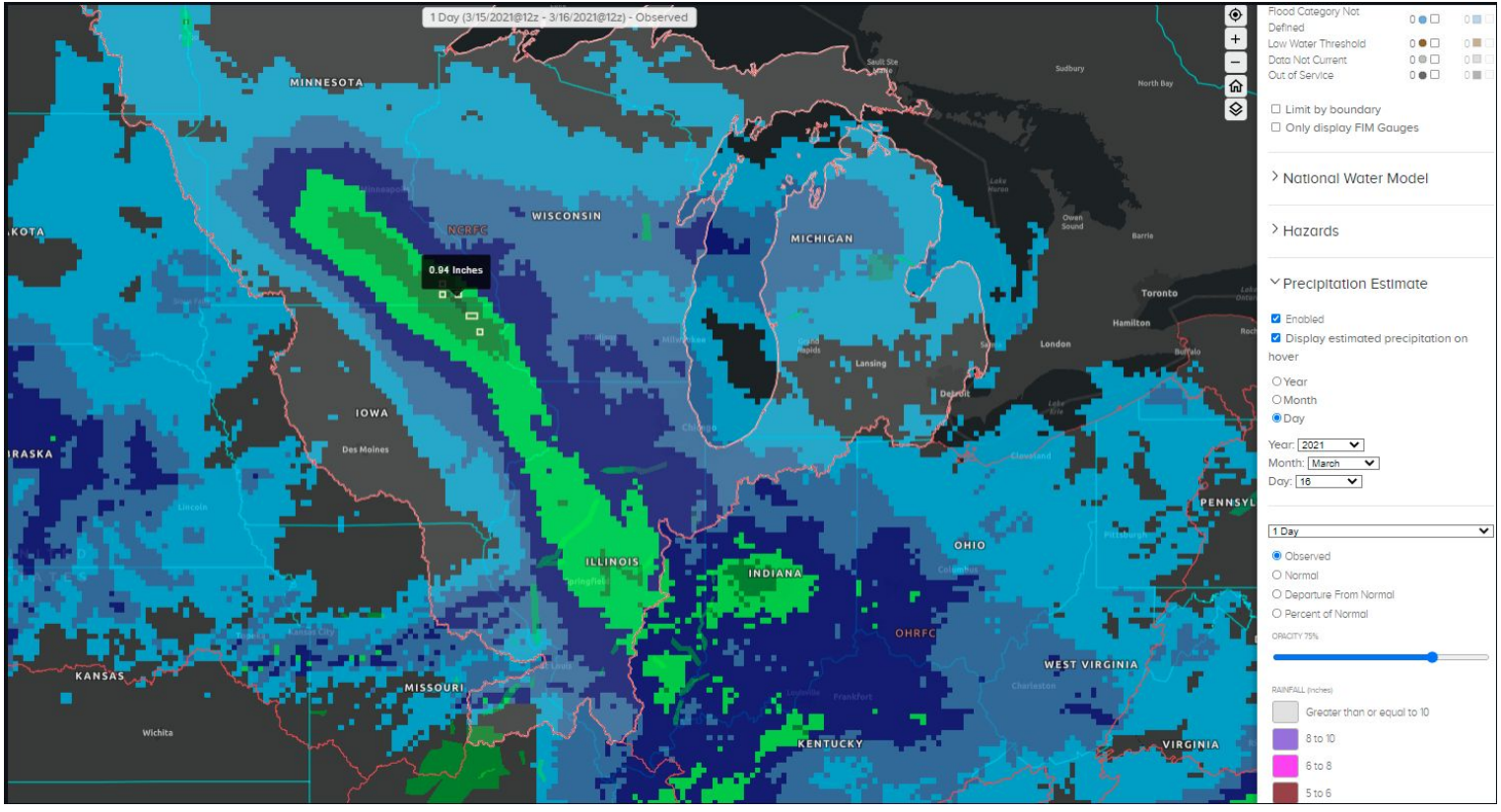


Cf: Hostach et al., 2018

- Am collaborating with CIROH researchers at UA on a proposal to create probabilistic flood maps.
- If funded, this would allow us to develop methods to characterize the uncertainties associated with both remotely sensed and modeled FIM approaches
- Long term goal would be to assimilate remotely sensed maps into the NWC's modeled FIM

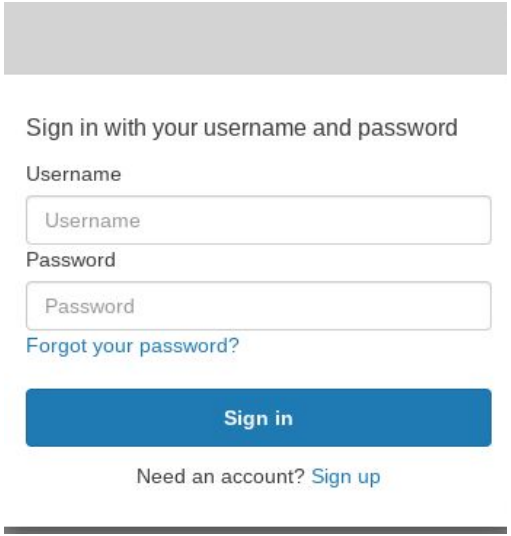
Next step: increased integration and collaboration

NWC NWPS platform:

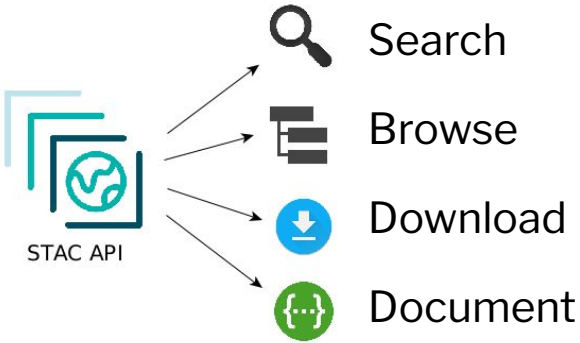


Next step: Finish implementing core WPN capabilities

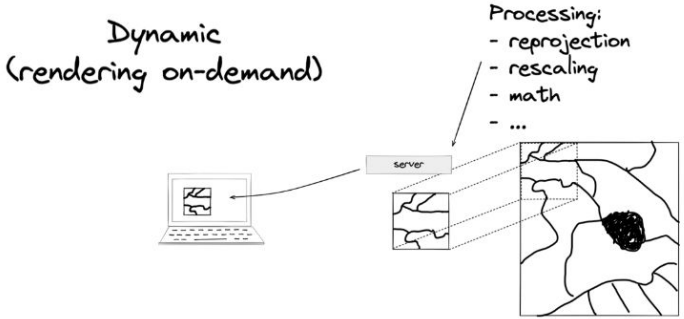
Authentication



Dynamic Data Catalog



Raster Tile Server



Conclusion

- The Water Prediction Node was resourced in July, 2023 and has made progress on the near-term goals outlined at the 2023 Water Prediction Node Strategy Summit
- 2024 will see the implementation of the WPN core services (content, data catalog, data serving) in a “minimum viable” form
- The Water Prediction Node will continue to be integrated into the workflows at the NWC is focusing on providing maximum value to its stakeholders