Databases, Retrieval & Products

Clint Campbell

DCDB CSB Technical Lead

Software Engineer

clinton.campbell@colorado.edu

Payton Cain

CSB Technical Expert

Software Engineer

payton.cain@colorado.edu

Cooperative Institute for Research in Environmental Sciences (CIRES)

NOAA National Centers for Environmental Information (NCEI)

IHO Data Center for Digital Bathymetry (DCDB)

Bathymetry Tools Workshop

Unlock the Potential of Crowdsourced Bathymetry

Databases, Retrieval & Products

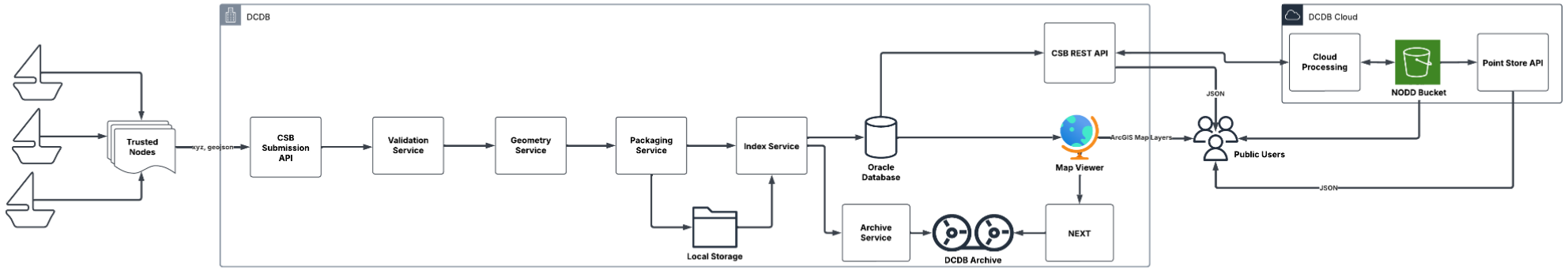
- Metadata generation, schemas & validation
- Fronting data into websites
- Fronting data into the cloud
- Finding and retrieving data from the DCDB
- Leveraging the DCDB

Unlock the Potential of Crowdsourced Bathymetry

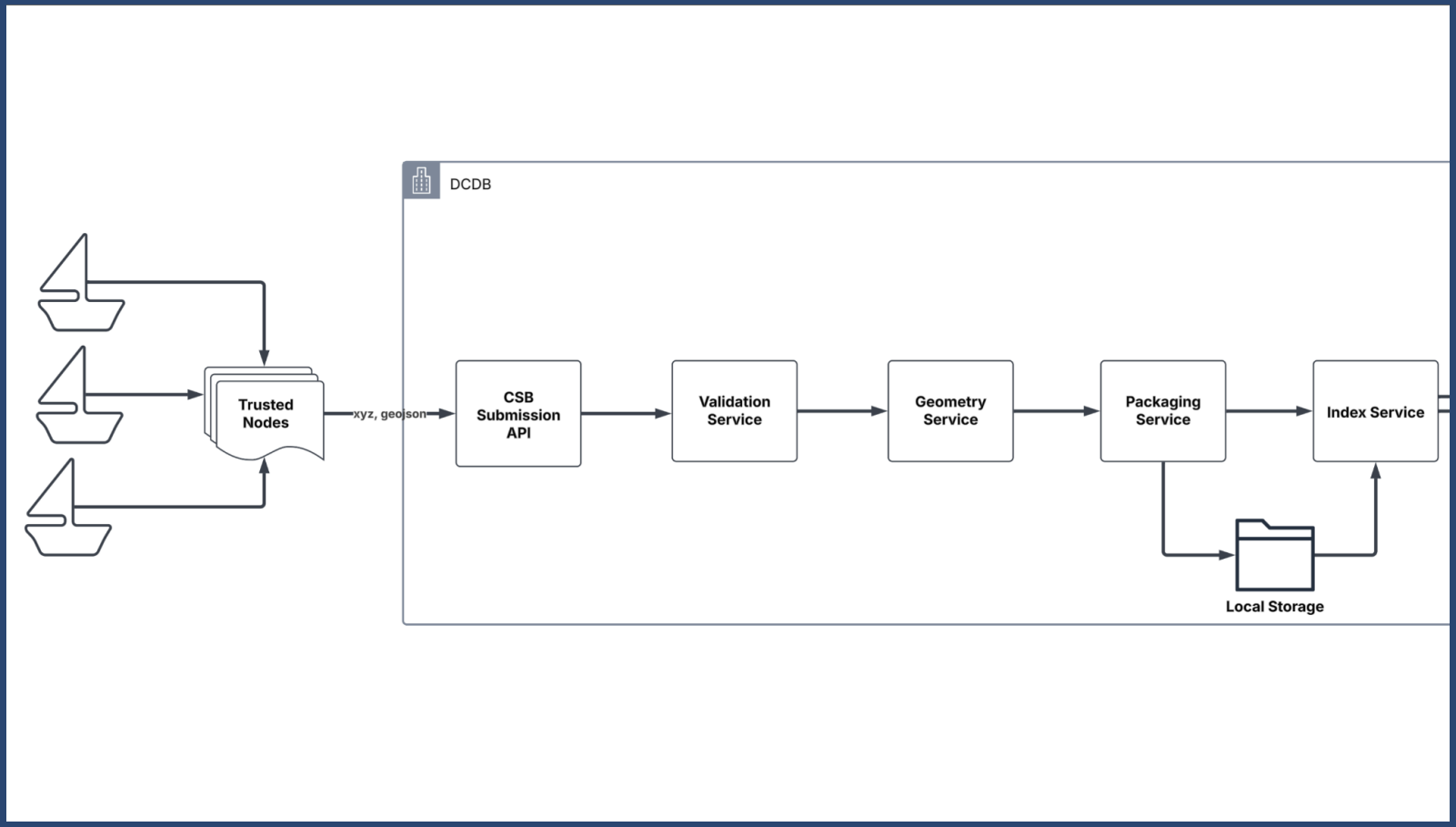
IHO

International Hydrographic Organization

IHO DCDB Data Flow



Metadata generation, schemas & validation



Metadata generation, schemas and validation

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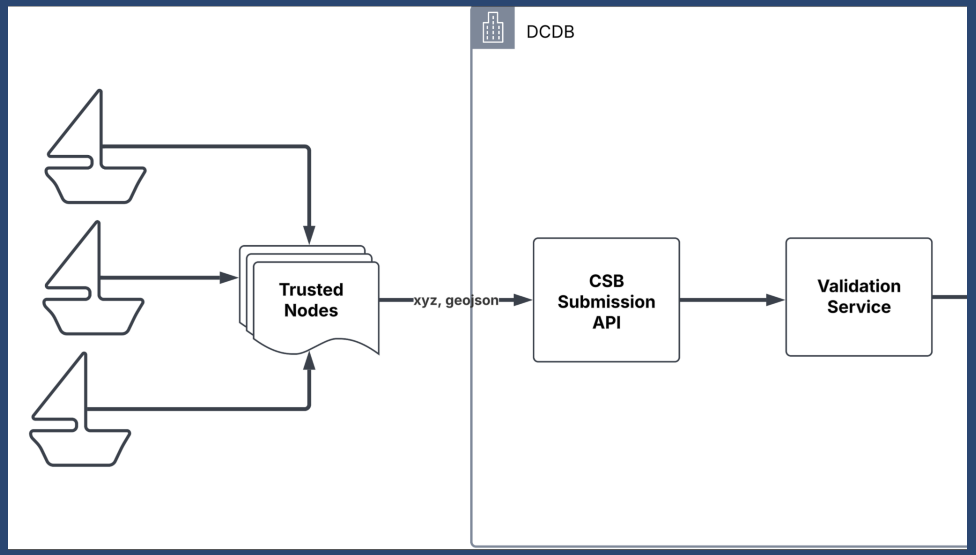
Validation Service

- **Raw data:**
  - Must be either **xyz** (csv) or **geojson** file
  - Must be **present day** or **past date**, cannot be in the future
  - Vessel speed must be **< 60** knots
- **Metadata:**
  - **Long**: cannot be blank, between **-180 and 180**
  - **Lat**: cannot be blank, between **-90 and 90**
  - **Depth**: cannot be blank
  - **Timestamp**: cannot be blank, **must be in the past**
  - Standardizes metadata format, saving it to the submission package



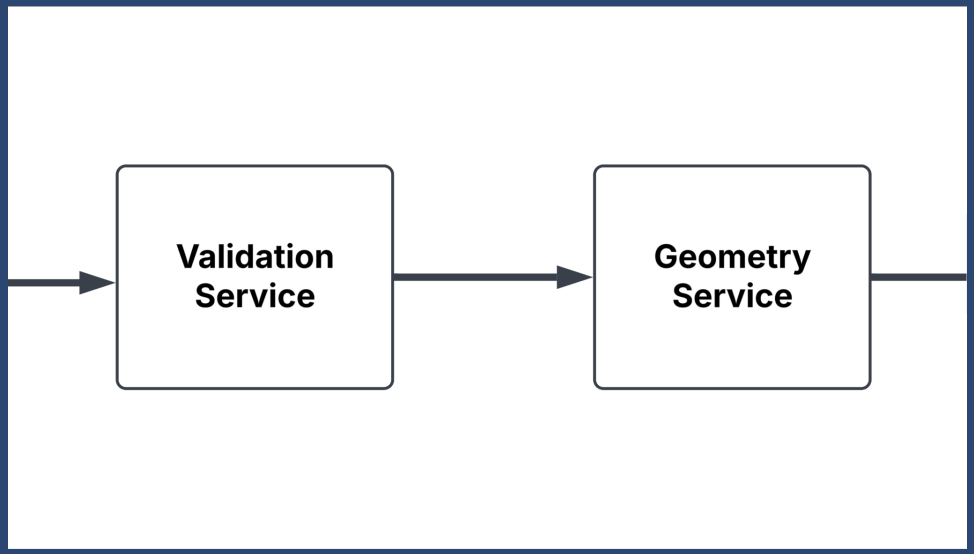
Submission package contains raw and processed data with standardized metadata

Metadata generation, schemas and validation

International Hydrographic Organization

Geometry Service

- **Filtering:**
  - Depending on coastal-state participation in CSB initiative, some data will not be marked publicly available
  - Depends on geographic location
- **Simplification:**
  - Simplified geometry computed using Douglas-Peucker algorithm (epsillon = 0.001 - 1.0)
  - Output written as geojson and xyz into submission package



Metadata generation, schemas and validation

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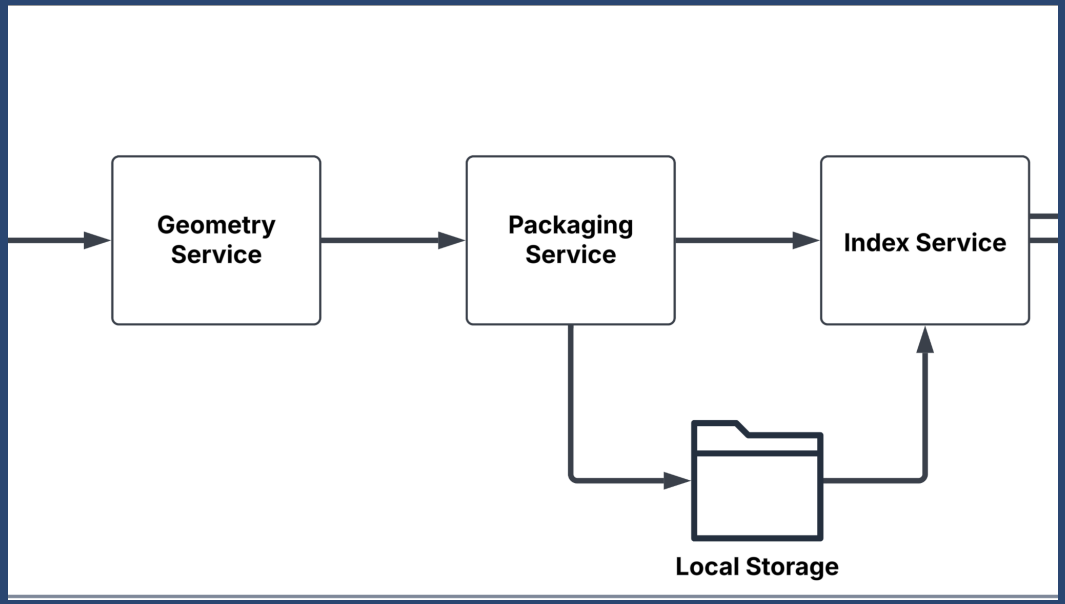
Packaging / Index Service

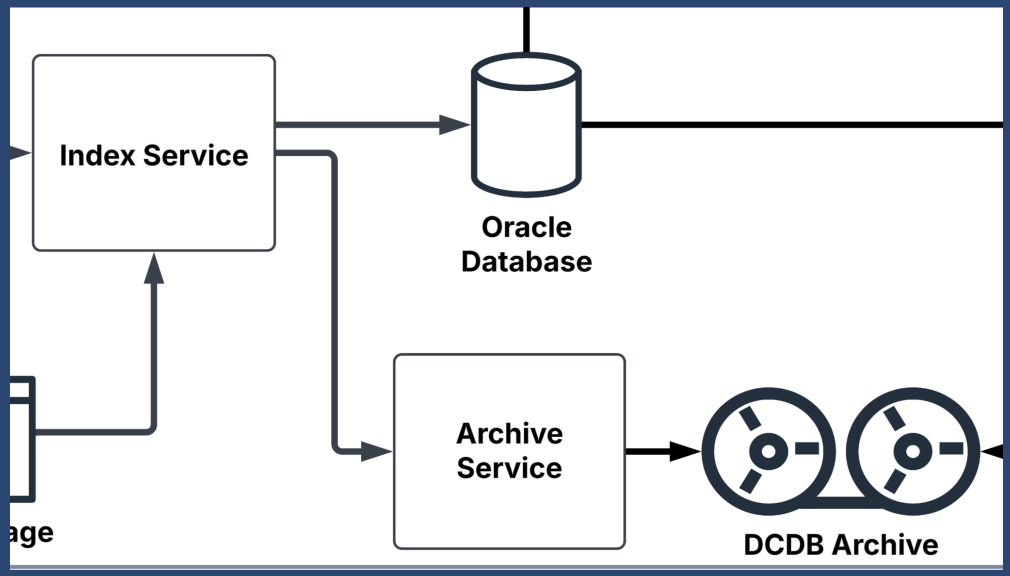
- Finalizes data submission package
- Saves to the DCDB's Oracle database
- Saves data to disk locally, allowing for download by **CSB REST API**
- Handles reprocessing runs (changes in simplification tolerance, nations opting in to CSB initiative)



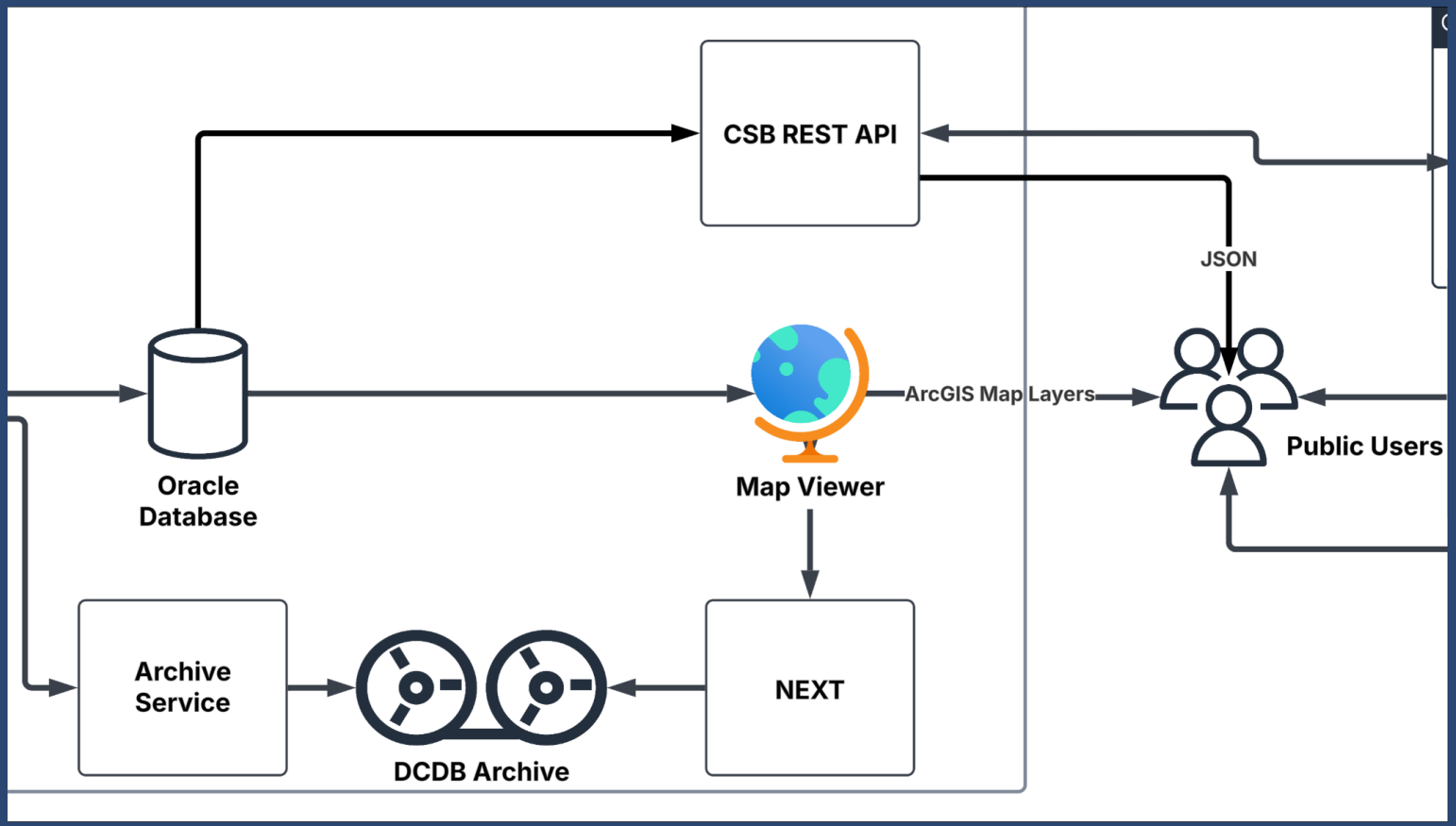
Metadata generation, schemas and validation

Crowbar Pipeline Outputs

- **Oracle Database:**
  - Datastore for CSB REST API
  - Allows for integration with additional DCDB datasets
- **DCDB Archive:**
  - Stores aggregated submission packages
  - Disaster recovery mechanism
  - Public data ordering mechanism



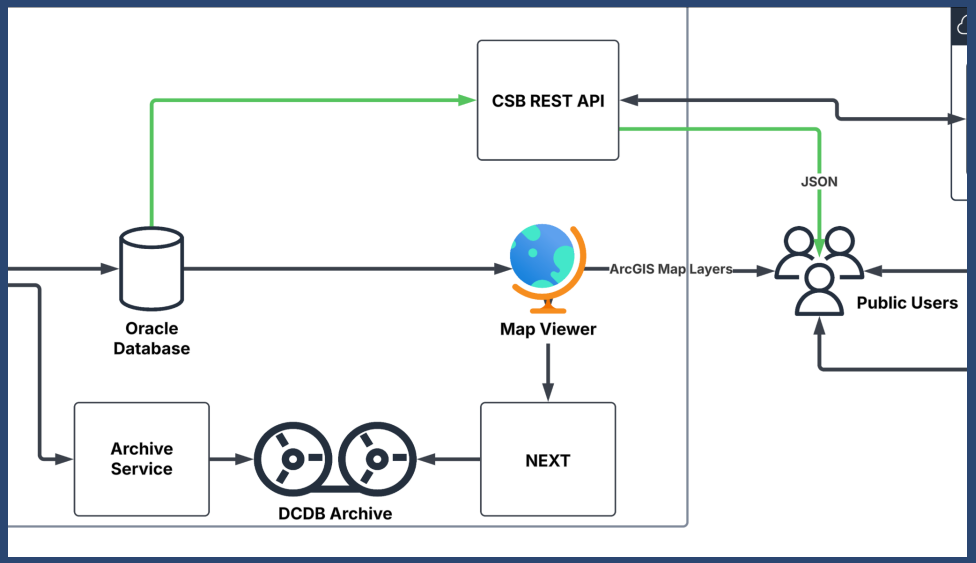
Fronting data into websites



Fronting data into websites

CSB REST API

- Queries paginated lists of CSB data submissions
- API Fields: File name, provider name, start/end times, geometry (GeoJSON), submission unique id (**trace id**)
- Submission metadata
- Displays location of submissions' processed csv file location in the **NODD S3 bucket**
- Performs downloads of data submission packages via a submission's trace id

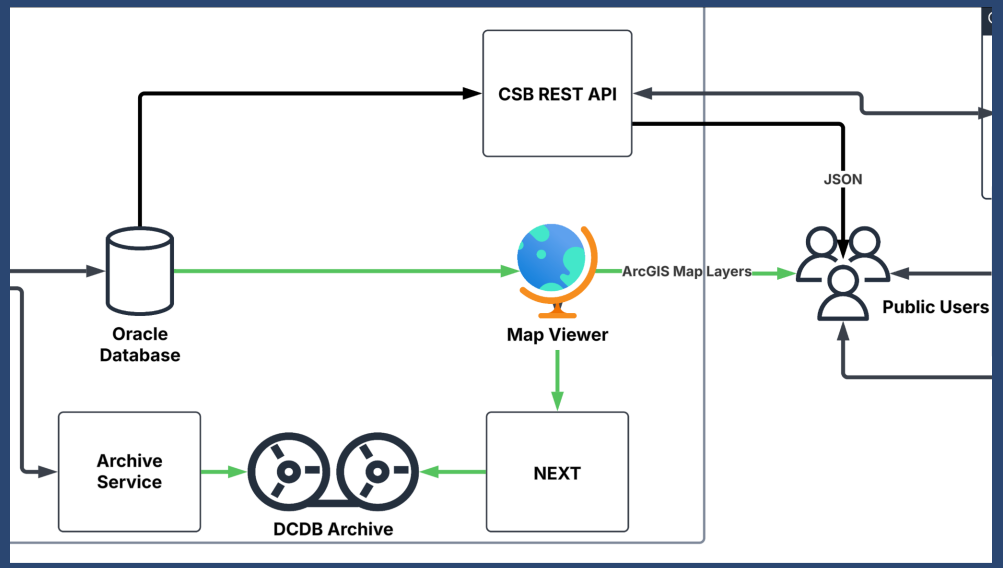


Fronting data into websites

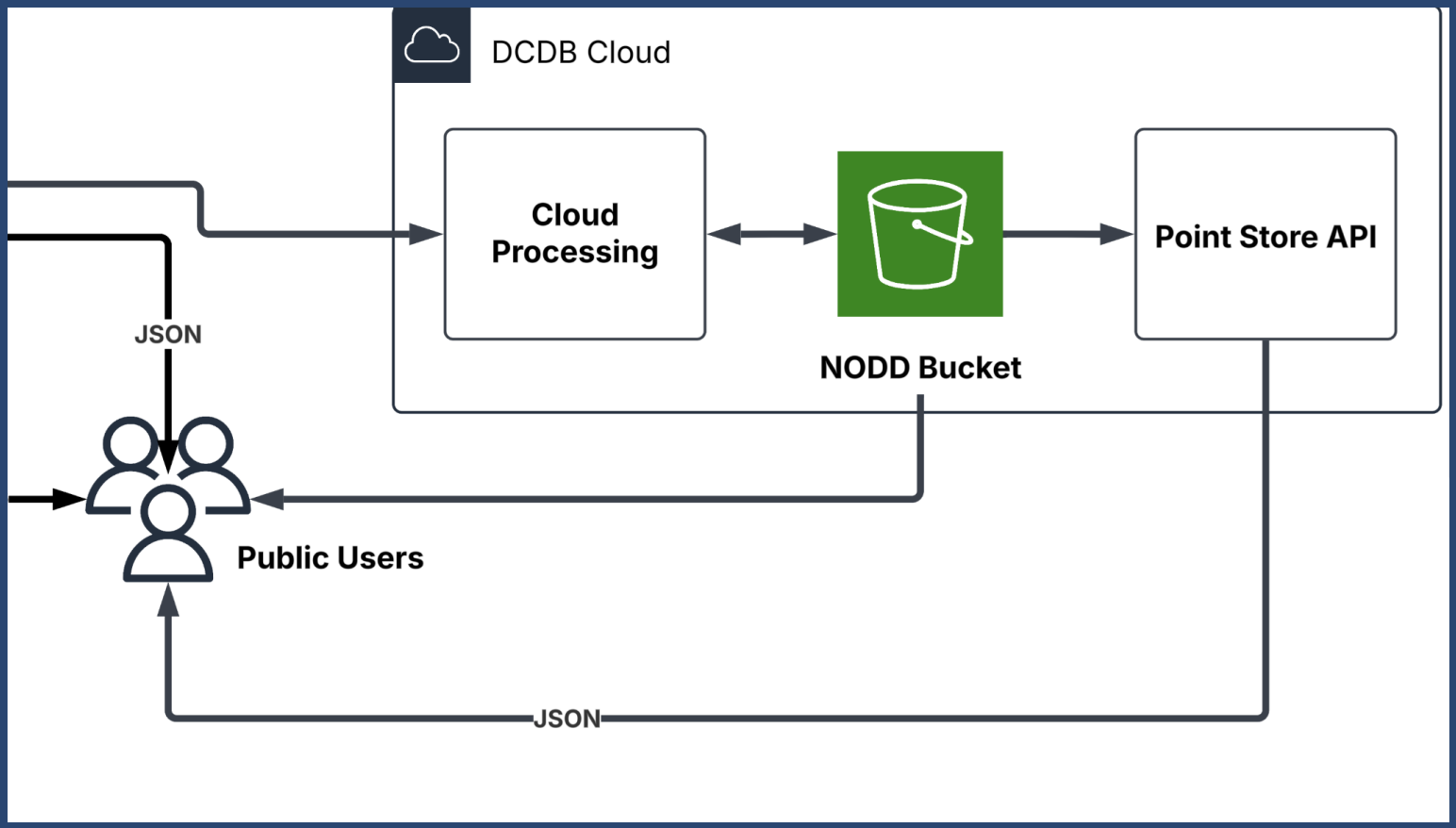
International Hydrographic Organization

DCDB Map Viewer

- ArcGIS service that queries the DCDB's Oracle database
  - Unpaginated map layer
- Global view of CSB data
- Integrates with additional DCDB data products:
  - multibeam bathymetry
  - coastal lidar
  - digital elevation models
- Integrates with NEXT for data orders from archive storage



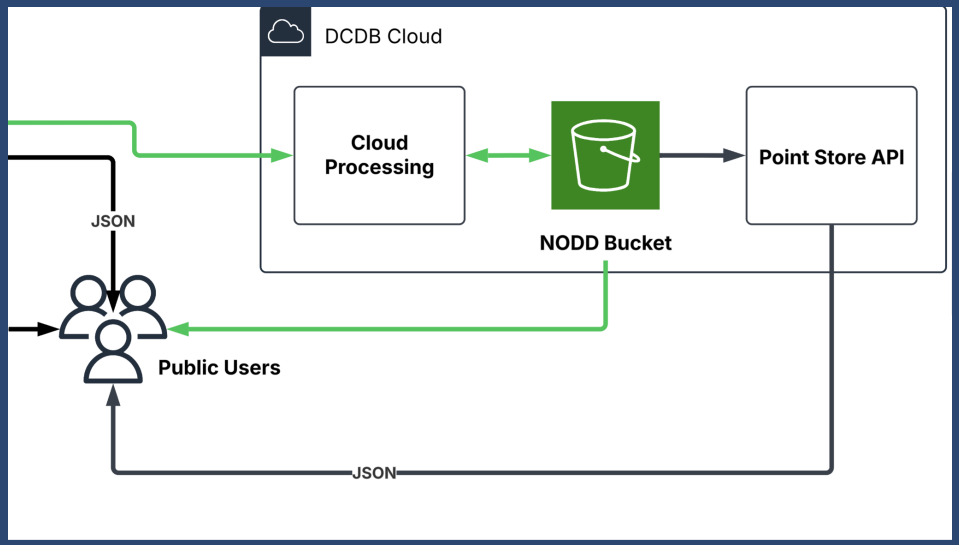
Fronting data into the cloud



Fronting data into the cloud

NODD Conveyor Service

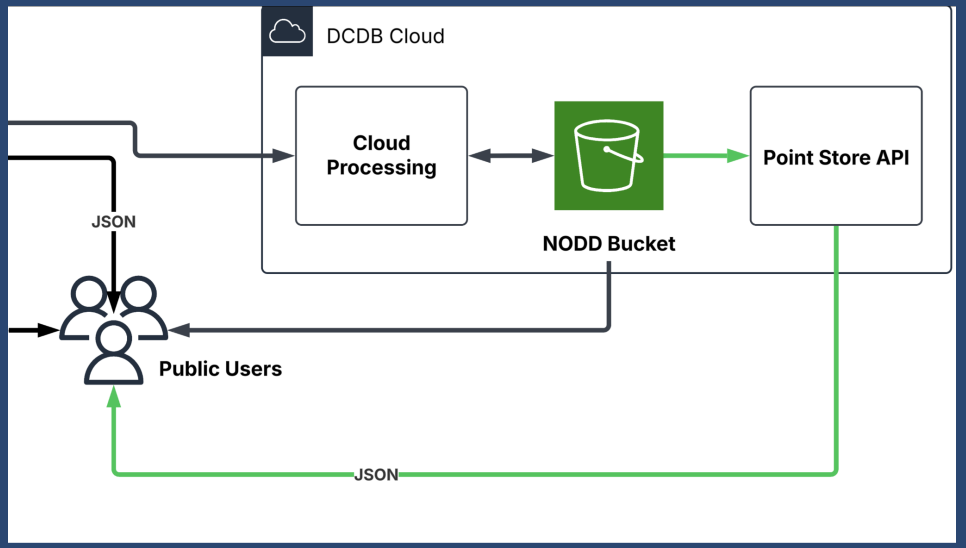
- Utilizes the **CSB REST API:**
  - Search for updates pertaining to published submissions within 1 day
  - Download result submission packages
- Reformats processed csv file headers:
  - UNIQUE_ID, FILE_UUID, LON, LAT, DEPTH, TIME, PLATFORM_NAME, PROVIDER
- Publishes data into the NODD S3 bucket
  - **Publicly accessible**
- CSV files are replaced or removed during reprocessing
  - Changes in simplification tolerance or coastal state participation in CSB initiative



Fronting data into the cloud

Data Extract API (Building the API's source Data)

- Processes items in **NODD S3 bucket**
- Filters processed CSV content
  - Removes duplicate soundings (lat, lon, depth)
- Computes H3 hexagonal spatial index
  - 1281 Km hexagon side length (level 0)
- Stores processed data in separate S3 bucket
- Data orders performed based on AWS Athena table
  - Queries S3 bucket containing processed data
  - Updated at interval of 1 day



Fronting data into the cloud

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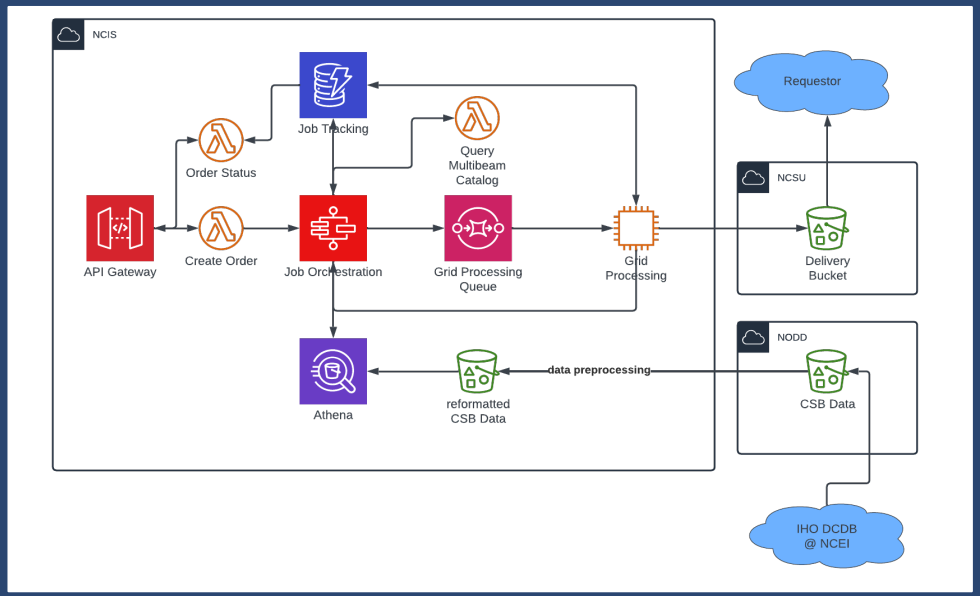
Data Extract API (Extracting API's source data)

- Asynchronous data orders placed via REST API
- Gather data matching search parameters
- If grid requested, run MBSYSTEM processing
- Place query results in delivery S3 bucket
- Results delivered 2 ways
  - User's email inbox if specified in request
  - Direct download from job status response



Finding and retrieving data from the DCDB

Finding and retrieving data from the DCDB

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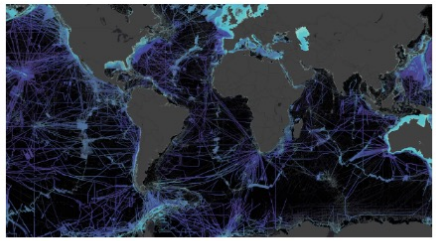
IHO Data Centre for Digital Bathymetry (DCDB)

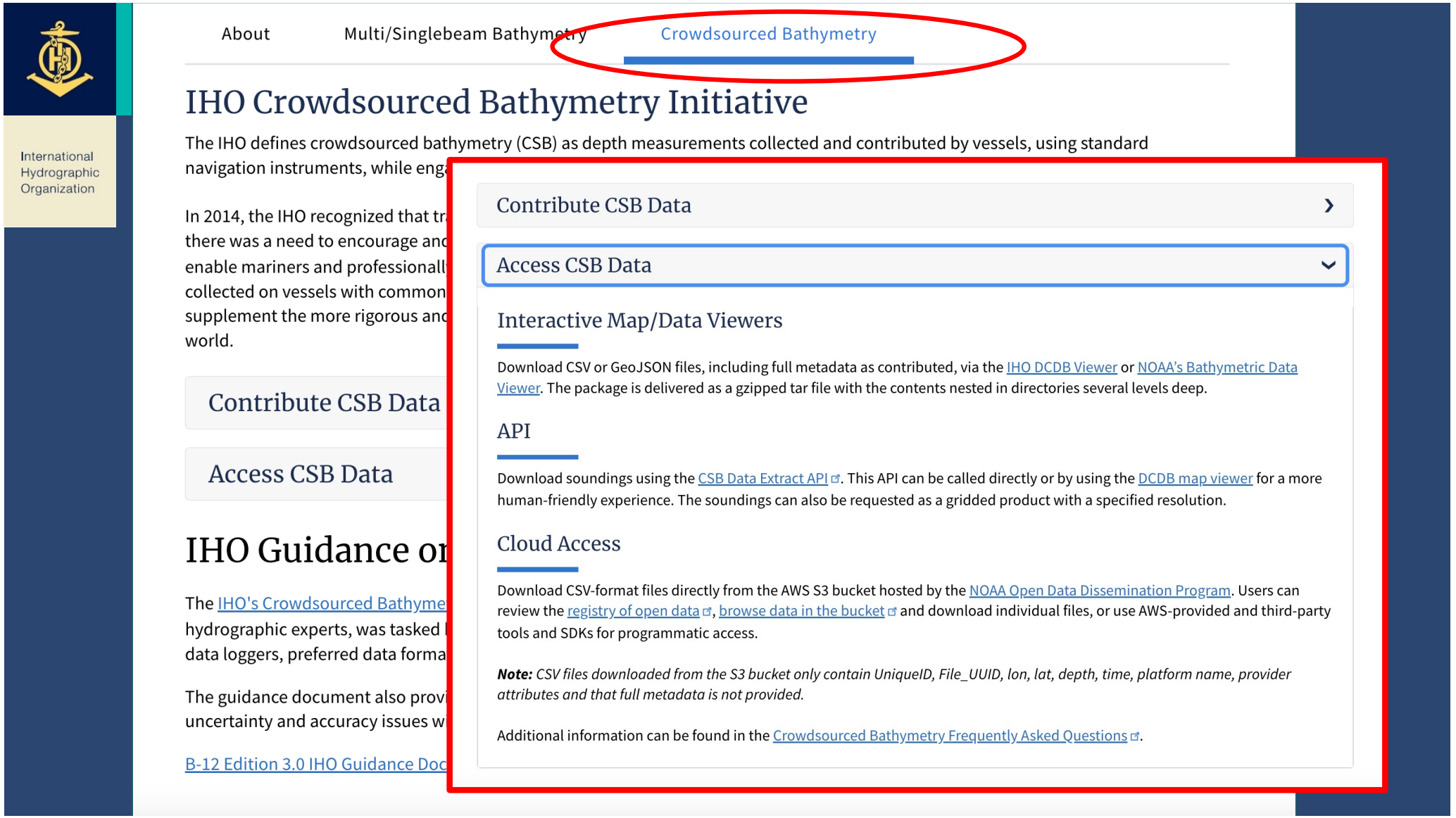
The International Hydrographic Organization (IHO) Data Centre for Digital Bathymetry (DCDB) was established in 1990 to steward the global collection of bathymetric data. The Centre archives and shares, freely and without restrictions, depth data contributed by mariners and other stakeholders consistent with IHO direction and guidance. The IHO DCDB is hosted by the U.S. National Oceanic and Atmospheric Administration (NOAA) on behalf of the IHO Member States.

The DCDB archive includes over 70 terabytes (uncompressed) of oceanic depth soundings acquired with multibeam and single beam sonars by hydrographic, oceanographic and industry vessels during surveys or while on passage.



25% of the deep ocean floor has been mapped with direct measurement and approximately 50% of the world's coastal waters remain unsurveyed. (Source: GEBCO)

About Multi/Singlebeam Bathymetry Crowdsourced Bathymetry


International Hydrographic Organization
About
Multi/Singlebeam Bathymetry
Crowdsourced Bathymetry
IHO Crowdsourced Bathymetry Initiative
The IHO defines crowdsourced bathymetry (CSB) as depth measurements collected and contributed by vessels, using standard navigation instruments, while eng
In 2014, the IHO recognized that tr
there was a need to encourage and
enable mariners and professionall
collected on vessels with common
supplement the more rigorous and
world.
Contribute CSB Data
Access CSB Data
IHO Guidance or
The IHO's Crowdsourced Bathyme
hydrographic experts, was tasked
data loggers, preferred data forma
The guidance document also provi
uncertainty and accuracy issues w
B-12 Edition 3.0 IHO Guidance Doc
Contribute CSB Data
Access CSB Data
Interactive Map/Data Viewers
Download CSV or GeoJSON files, including full metadata as contributed, via the IHO DCDB Viewer or NOAA's Bathymetric Data Viewer. The package is delivered as a gzipped tar file with the contents nested in directories several levels deep.
API
Download soundings using the CSB Data Extract API. This API can be called directly or by using the DCDB map viewer for a more human-friendly experience. The soundings can also be requested as a gridded product with a specified resolution.
Cloud Access
Download CSV-format files directly from the AWS S3 bucket hosted by the NOAA Open Data Dissemination Program. Users can review the registry of open data, browse data in the bucket and download individual files, or use AWS-provided and third-party tools and SDKs for programmatic access.
Note: CSV files downloaded from the S3 bucket only contain UniqueID, File_UUID, lon, lat, depth, time, platform name, provider attributes and that full metadata is not provided.
Additional information can be found in the Crowdsourced Bathymetry Frequently Asked Questions.

Leveraging the DCDB

Personalized Workflows

Leveraging the DCDB

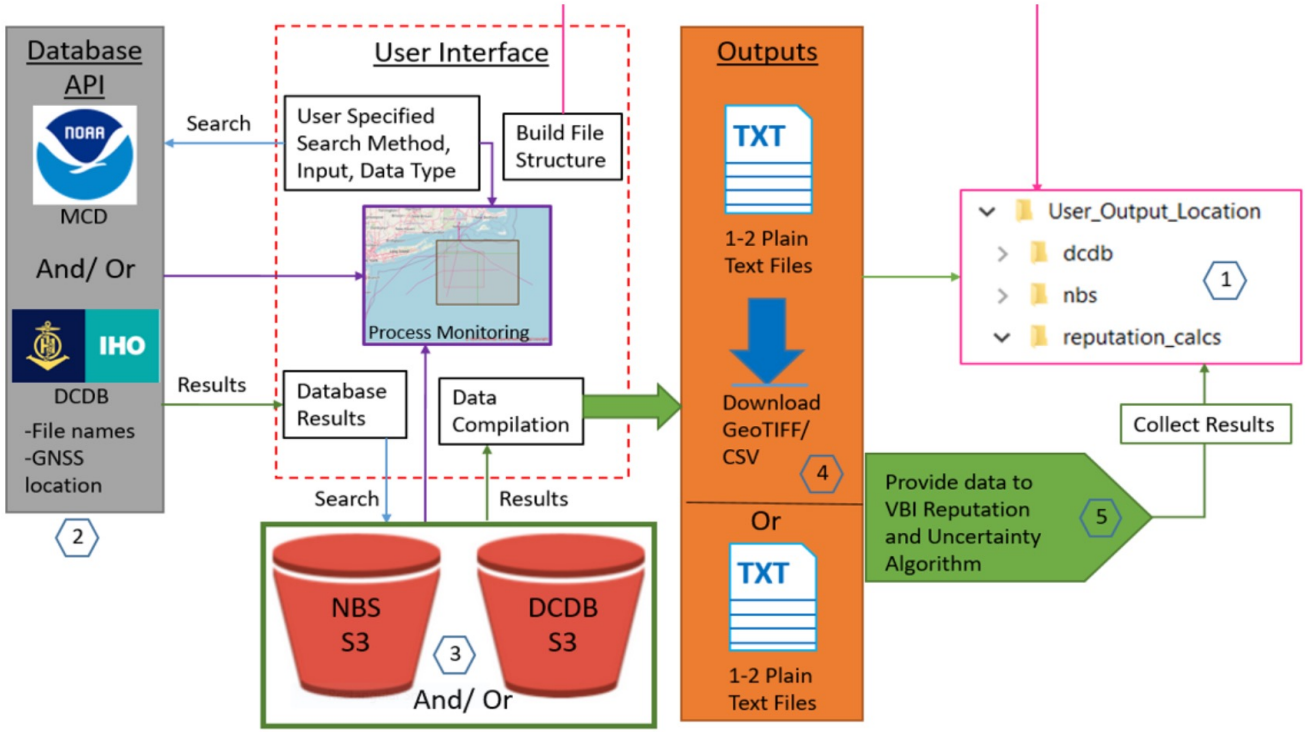


Fig. 1 Implementation architecture for the DCDB / NBS version of VBI Compare, illustrating the general workflow for S3 and API queries for the two databases.

Debroisse and Miles (2024, IHR)

Leveraging the DCDB

International Hydrographic Organization

Correlating NODD Bucket to CSB REST API

- Download file from **NODD S3 bucket**
  - 20250313000211727302_65f387283db579-85606499_pointData.csv
- Examine rows in file, take note of FILE_UUID value
  - should be same value across all rows
- Query for metadata in **CSB REST API** using “fileNameEquals” parameter, adding .tar.gz to the FILE_UUID

UNIQUE_ID	FILE_UUID	LON	LAT	DEPTH
ROSEP-c397eae3-6787-4d49-abbe-1de3758956f5	20250303053113804110_c397eae3-6787-4d49-abbe-1de3758956f5	-94.786303	29.318502	4
ROSEP-c397eae3-6787-4d49-abbe-1de3758956f5	20250303053113804110_c397eae3-6787-4d49-abbe-1de3758956f5	-94.786307	29.318517	3.8
ROSEP-c397eae3-6787-4d49-abbe-1de3758956f5	20250303053113804110_c397eae3-6787-4d49-abbe-1de3758956f5	-94.786303	29.31851	4
ROSEP-c397eae3-6787-4d49-abbe-1de3758956f5	20250303053113804110_c397eae3-6787-4d49-abbe-1de3758956f5	-94.786305	29.318508	4

index-service/api/v1/csb/index?fileNameEquals=20250303053113804110_c397eae3-6787-4d49-abbe-1de3758956f5.tar.gz

Thank you.

Clint Campbell
clinton.campbell@colorado.edu

Payton Cain
payton.cain@colorado.edu

Crowdsourced Bathymetry Tools Workshop

Unlock the Potential of Crowdsourced Bathymetry

Links and References

- DCDB Map Viewer: https://www.ncei.noaa.gov/maps/bathymetry/
- Point Store Documentation: https://github.com/CI-CMG/pointstore-api-docs/blob/main/csb_readme.html
- IHO B-12 3.0: https://iho.int/uploads/user/pubs/bathy/B_12_CSB-Guidance_Document-Edition_3.0.0_Final.pdf
- Guidance for submitting CSB Data to the DCDB: https://www.ncei.noaa.gov/sites/g/files/anmtlf171/files/2024-04/GuidanceforSubmittingCSBDataToTheIHODCDB%20%281%29.pdf
- Sample CSB File Formats: https://www.ncei.noaa.gov/sites/g/files/anmtlf171/files/2024-04/SampleCSBFileFormats.pdf
- **IHO Data Centre for Digital Bathymetry (DCDB): https://www.ncei.noaa.gov/iho-data-centre-digital-bathymetry**
- **CSB Data Extract API: http://csb-pointstore-dashboard.s3-website-us-west-2.amazonaws.com/**
- **CSB REST API Documentation: https://www.ngdc.noaa.gov/ingest-external/crowbar/view/main/api-docs?urls.primaryName=Search%20API**
- **CSB REST API URL: https://www.ngdc.noaa.gov/ingest-external/index-service/api/v1/csb/index**