

ABSTRACT

As earth observing services and techniques have flourished, data and products have exponentially grown, like the proliferation of Global Navigation Satellite System (GNSS) stations capable of providing real-time data, Satellite Laser Ranging (SLR) stations shifting to kHz lasers, and Very-Long-Baseline Interferometry (VLBI)'s implementation of VLBI Global Observing System (VGOS) telescopes. The CDDIS is continually evolving to fulfill the new storage, quality check, and latency requirements that these changes bring, as well as meet new standards such as the shift toward FAIR and open science. These have shaped how the CDDIS develops new software and resources. Beginning next year, the CDDIS will begin to transition their data and products to the Amazon Web Services (AWS) cloud, beginning with DORIS data. This poster will highlight the CDDIS's recently updated processing system, new data and products available, and future work.

GNSS GUARDIAN NEAR-REAL-TIME IONOSPHERIC TOTAL ELECTRON CONTENT PRODUCT

Description: Developed at NASA Jet Propulsion Laboratory (JPL), the GNSS-based Upper Atmosphere Realtime Disaster Information and Alert Network (GUARDIAN) is near-real-time (NRT) ionospheric monitoring software (Martire et al, 2023). Its main products are NRT total electronic content (TEC) time series, allowing users to explore ionospheric TEC perturbations due to natural and anthropogenic events on Earth. The NRT GUARDIAN time series are validated against well-established post-processing methods. Currently, time series are computed for more than 90 GNSS ground stations distributed around the Pacific Ring of Fire, which monitor the four main GNSS constellations (GPS, Galileo, BDS, and GLONASS).

Uses:

- Earthquake
- USGS Tsunami Watch
- Volcanic Eruptions
- Geomagnetic Storms

GUARDIAN Website



CDDIS DOI Landing Page



CDDIS Support: The product is stored in the CDDIS archive. To support latency needs for the NRT data, the CDDIS shifted from processing at scheduled intervals to processing files using middleware. This allows for files to be queued for ingest. In addition to the change in upload procedures, the CDDIS has also updated their processing software to simplify CDDIS's transition to the EarthData Cloud.

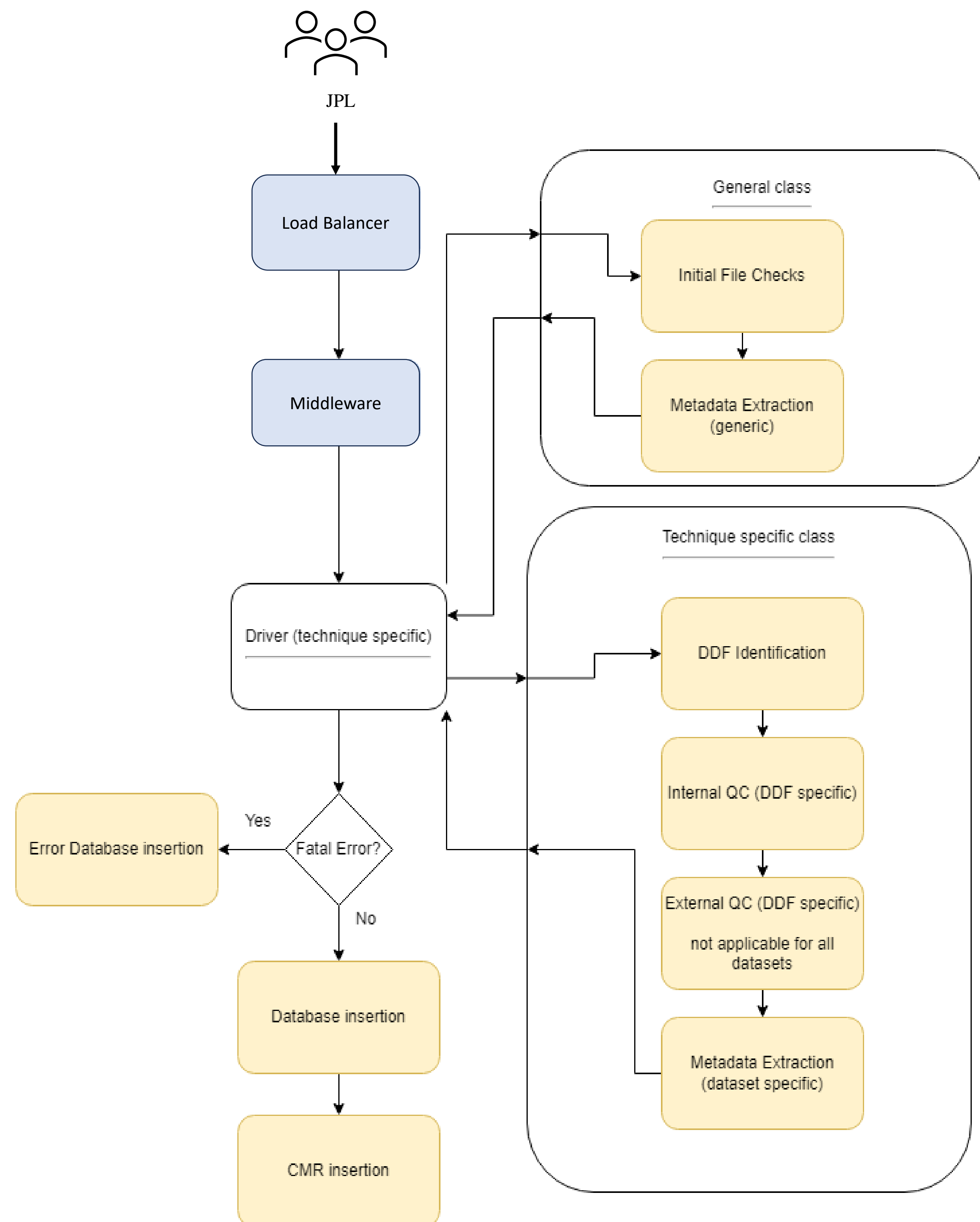


Figure 1: The CDDIS Processing V4 Software Flow Diagram

SLR ITRF2020 PRODUCTS (REPRO2020)

Description: The International Laser Ranging Service (ILRS) contributions to the newest International Terrestrial Reference Frame, ITRF2020, includes station positions and earth orientation parameters time series. Its main products are weekly and bi-weekly station position estimates along with daily and 3-day average Earth Orientation Parameters (EOP) estimated over 7-day arcs and 15-day arcs from 1983-1993.

Uses:

- International Terrestrial Reference Frame
- Station data quality and systematic error modeling
- Gravity modeling

CDDIS DOI Landing Page



CDDIS Support: The REPRO2020 is the first SLR product in which direct input from the ILRS community was obtained to create the landing pages. The community helped ensure credit was provided to the analysis centers, that the location of the landing page was clear, and encouraged the use of DOIs.

SLR2020 PRODUCTS

Description: In addition to contributions to the ITRF2020, the SLR2020 products include an expanded set of SLR station positions and velocities in the ITRF2020 frame. It includes historical sites that are not included in the ITRF2020 and new stations accepted after the creation of the ITRF2020.

Uses:

- Monitor station performance
- Corrections for SLR tracking data

CDDIS DOI Landing Page



CDDIS Support: In addition to archiving and creating the landing pages for these products, the CDDIS updated the ILRS website with the newest files for analysts to access.

CDDIS CLOUD ONBOARDING

Description: The CDDIS is transitioning to the Earthdata Cloud to fully realize NASA's goals for open science. The primary focus of these efforts is to ensure the accessibility of NASA data by reducing the barriers to entry within the science community while increasing traceability and reproducibility of research.

Once the CDDIS has shifted to the Earthdata Cloud, users will have access to the following benefits:

- Access to full features on Earthdata Search including searchability and download directly from Earthdata
- Ability to work with the CDDIS data and products in the cloud – downloads will no longer be required, reducing the need to invest in on-premises resources
- Easier identification of collocated data from across the NASA DAACs
- Access to new tools for subscribing and analyzing data

The CDDIS is also working to ensure the following as data and products are migrated to the cloud:

- Guaranteeing the data and products have a DOI and landing page, especially for older data sets
- Reorganize the data/products into clearer collections with the input from representatives of the techniques supported
- More thorough QC is created for each of the file types
- Data can be downloaded based on temporal specifications

Please note that, even as the CDDIS transitions to the cloud, users will still be able to download data to their servers and the original archive structure will still be maintained. EOSDIS is also investing in helping scientists transition to the cloud through training initiatives.

Current Progress: In the summer and fall of 2023, the CDDIS began onboarding to the EOSDIS Ingest and Archive train. With a focus on project planning and gaining familiarity with the software environment (AWS and CUMULUS), the preliminary steps taken are essential to make concrete progress in 2024.

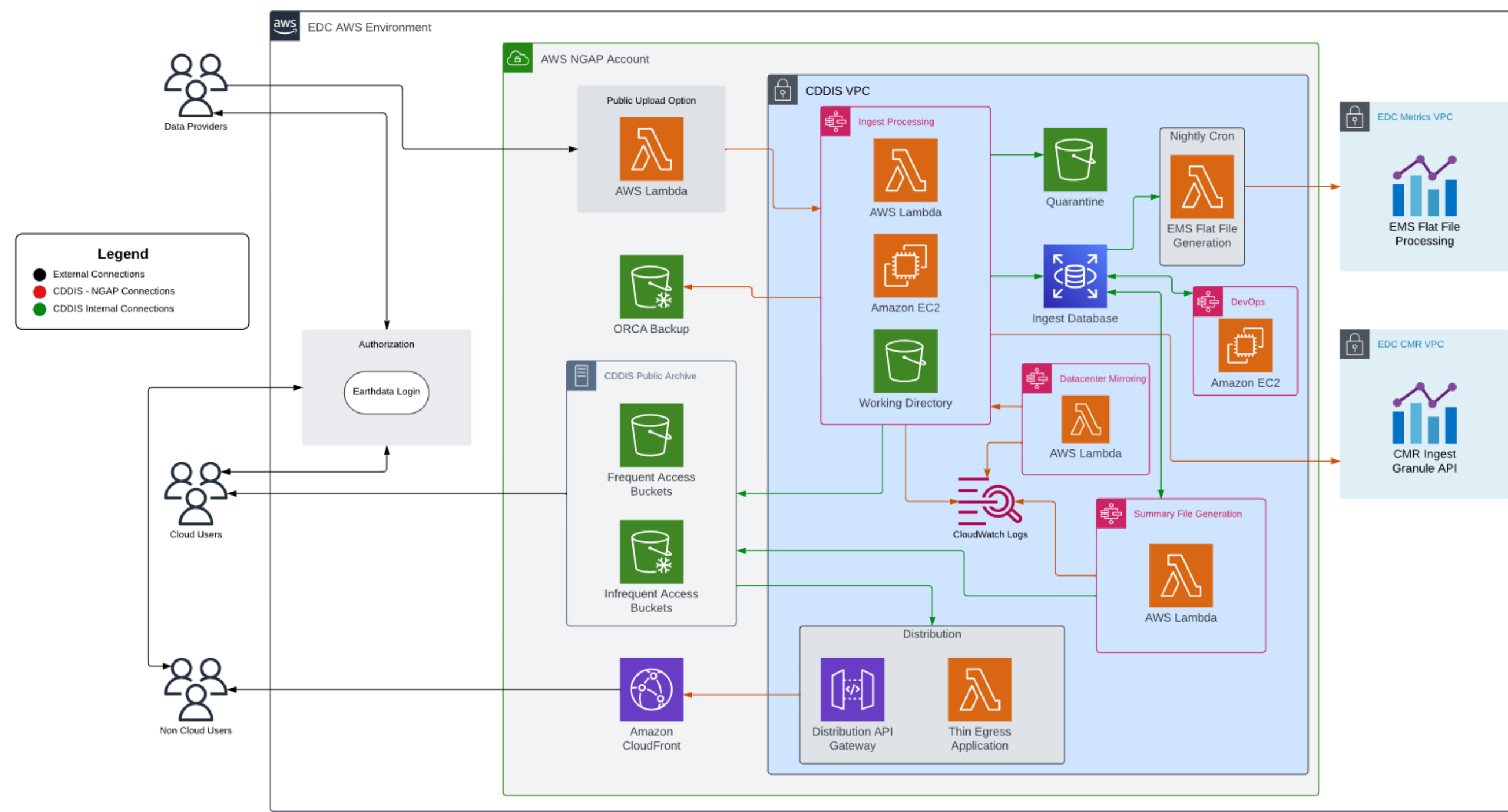


Figure 3: The CDDIS Flow Diagram for onboarding to the Cloud

Next Steps: In 2024, the CDDIS hopes to have its first collections in the Earthdata Cloud. Their first focus will be on the DORIS data and, once available, the CDDIS will work with the community to transition.

GNSS REAL-TIME (NTRIP) SYSTEM STATUS AND LATENCIES

Description: The CDDIS has real-time streaming software (NTRIP, Networked Transport of RTCM via Internet Protocol) for receipt and transmission of real-time GNSS data and product streams in support of the International GNSS Service (IGS) Real Time Service. The available product streams consist of GNSS orbit and clock corrections

Use:

- Precise point positioning
- Time synchronization
- Disaster monitoring

CDDIS-Caster NTRIP Broadcaster



Real-time Map



CDDIS Support: The CDDIS has been supporting GNSS real-time data streaming since 2018 via the CDDIS-Caster NTRIP broadcaster. This year, to provide additional usability and clarity to users, the CDDIS created a real-time map showing which streams are active and their latencies.

CDDIS Real-time Streams

More information about the real-time streams available through the CDDIS caster can be viewed in the following tables:

- CDDIS caster active data streams
- CDDIS caster inactive data streams

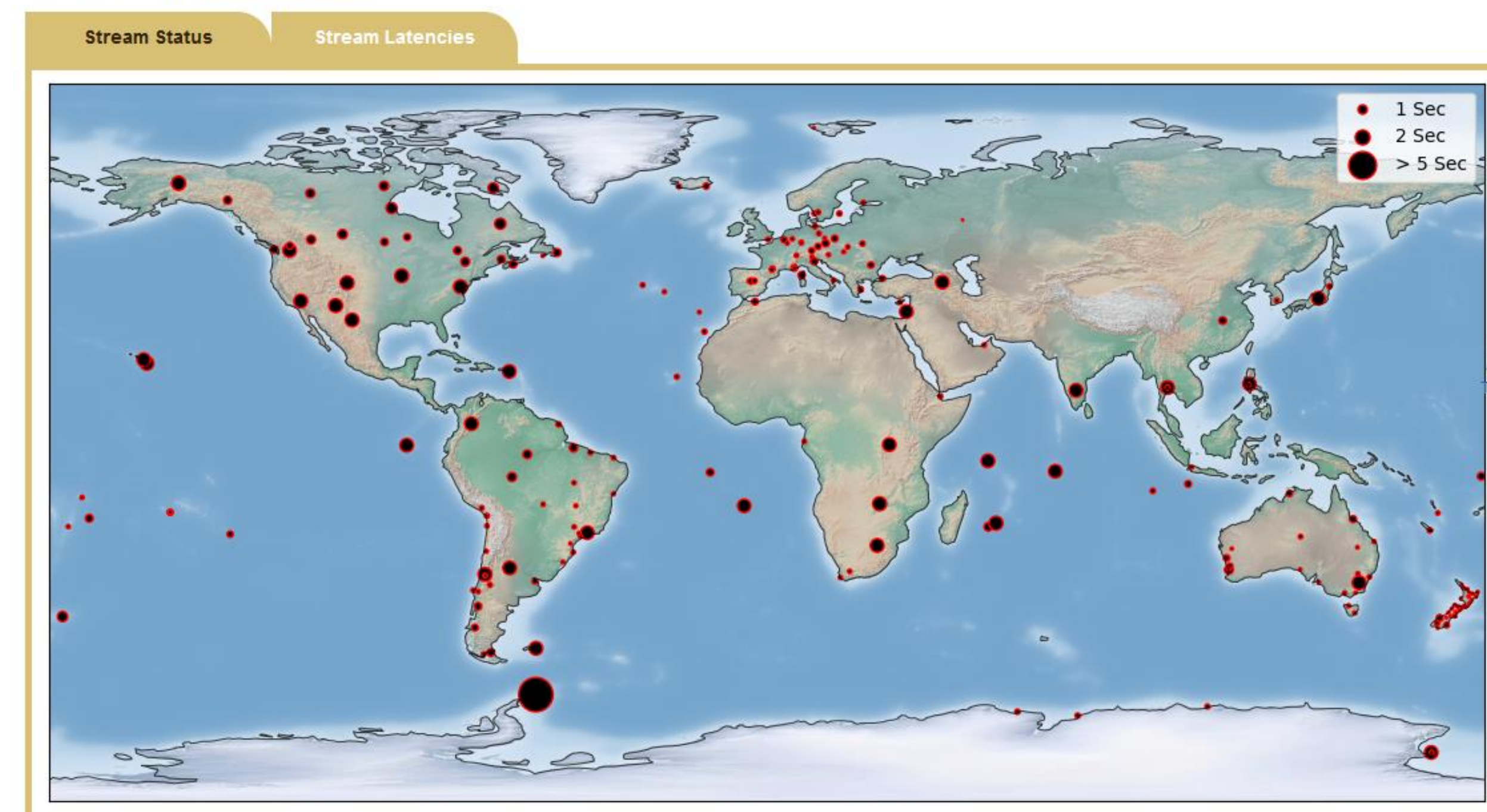


Figure 2: The CDDIS Real-Time Stream Latencies Map

CHANGES TO README FILES – FOCUS ON LANDING PAGES

Description: The CDDIS README files are used to provide an overview of files available in the CDDIS archive. Beginning with SLR, the CDDIS listed all the subdirectories under the technique including corresponding landing page. The landing pages contain through information about the data/products and include information on how to cite the data via DOIs.



Overview

Welcome to the CDDIS Laser Ranging (SLR and LRL) Archive
ILRS data users are reminded to follow the ILRS recommended procedures, standards and models to ensure the maximum accuracy of their products. If in doubt, please contact the appropriate Working Group chair, or the ILRS Central Bureau.

- For more information please see the ILRS website at: <https://ilrs.gsfc.nasa.gov/>
- For more information on the CDDIS Archive, including citation information, please see: <https://cddis.nasa.gov/>

Primary Directory Structure

Below is a summary of the directory structure with applicable links to Landing Pages with DOIs. Please cite the DOIs in your publications. Please note that directories in bold indicates that the files in the directory are in the most recent format.

Directory	Data/Product and Landing Page
/slr/data/	Full-rate SLR data
/slr/data/fr/	Monthly and daily satellite full-rate files
/slr/data/fr/SNAME/YYYY/	Monthly: https://cddis.nasa.gov/Data_and_Derived_Products/SLR/slr_data_monthly_fr.html Daily: https://cddis.nasa.gov/Data_and_Derived_Products/SLR/slr_data_daily_fr.html
/slr/data/fr/SNAME/YYYY/sum/	Summary of the satellite full-rate files
/slr/data/fr/SNAME/daily/SSSS/	Daily satellite full-rate files
/slr/data/fr/SNAME/npt/	Monthly satellite normal point data and summary files from full-rate
/slr/data/fr_cr/	Full-rate SLR data (CRD V1 format)
/slr/data/fr_cr/SNAME/YYYY/	Monthly and daily satellite full-rate files
/slr/data/fr_cr/SNAME/YYYY/sum/	Summary files for the monthly full-rate data
/slr/data/fr_cr/SNAME/daily/SSSS/	Daily satellite full-rate files
/slr/data/fr_cr/SNAME/npt/	Monthly satellite normal point data and summary files from full-rate
/slr/data/fr_cr_v2/	Full-rate SLR data (CRD V2 format)
/slr/data/fr_cr_v2/SNAME/YYYY/	Monthly and daily satellite full-rate files
/slr/data/fr_cr_v2/SNAME/YYYY/sum/	Summary files for the monthly full-rate data
/slr/data/fr_cr_v2/SNAME/daily/SSSS/	Daily satellite full-rate files
/slr/data/fr_cr_v2/SNAME/npt/	Monthly satellite normal point data and summary files from full-rate
/slr/data/npt/	SLR on-site normal point data
/slr/data/npt/SNAME/YYYY/	Normal point data daily, monthly, and yearly files
/slr/data/npt/SNAME/YYYY/sum/	Summary files for the monthly full-rate data
/slr/data/npt/SNAME/daily/SSSS/	Daily satellite full-rate files
/slr/data/npt/SNAME/npt/	Monthly satellite normal point data and summary files from full-rate

Figure 4: Partial Screenshot of the SLR README File

HOW TO CITE OUR DATA

The CDDIS would like to encourage users to cite our data to ensure providers are given proper credit for their contributions in addition to improving reproducibility and other benefits. On the CDDIS website, find the appropriate landing page under the "Data and Products" tab and the technique. In addition to finding landing pages via the README files, users can also find DOIs via the CDDIS Website.



Figure 5: The CDDIS Website

Select the "Data and Product" tab and the technique from which data or product was used:

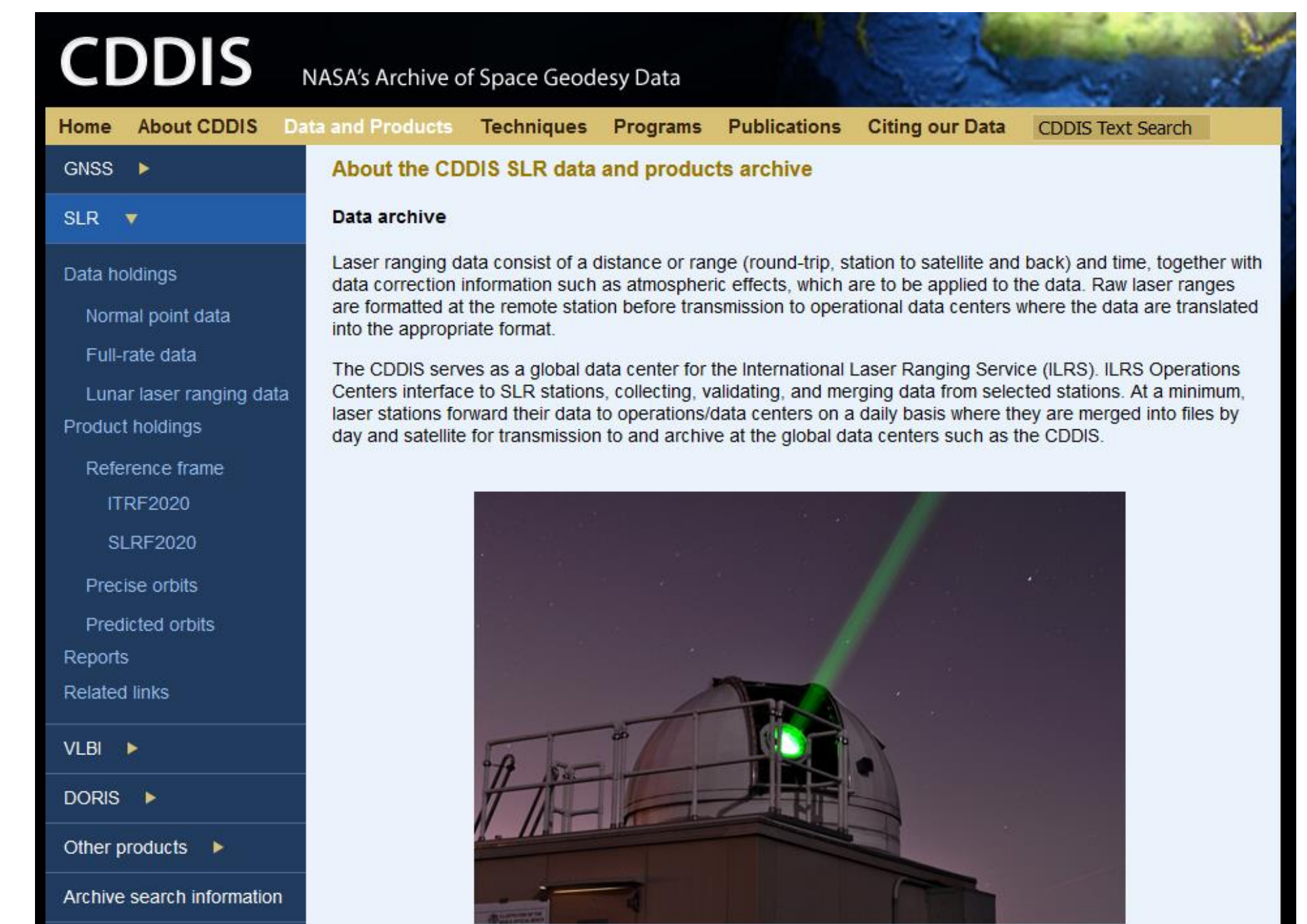


Figure 6: SLR Page on the CDDIS Website

Then select the data or product used from the left navigation panel.

Some pages contain links to the landing pages:

While others go directly to the landing page

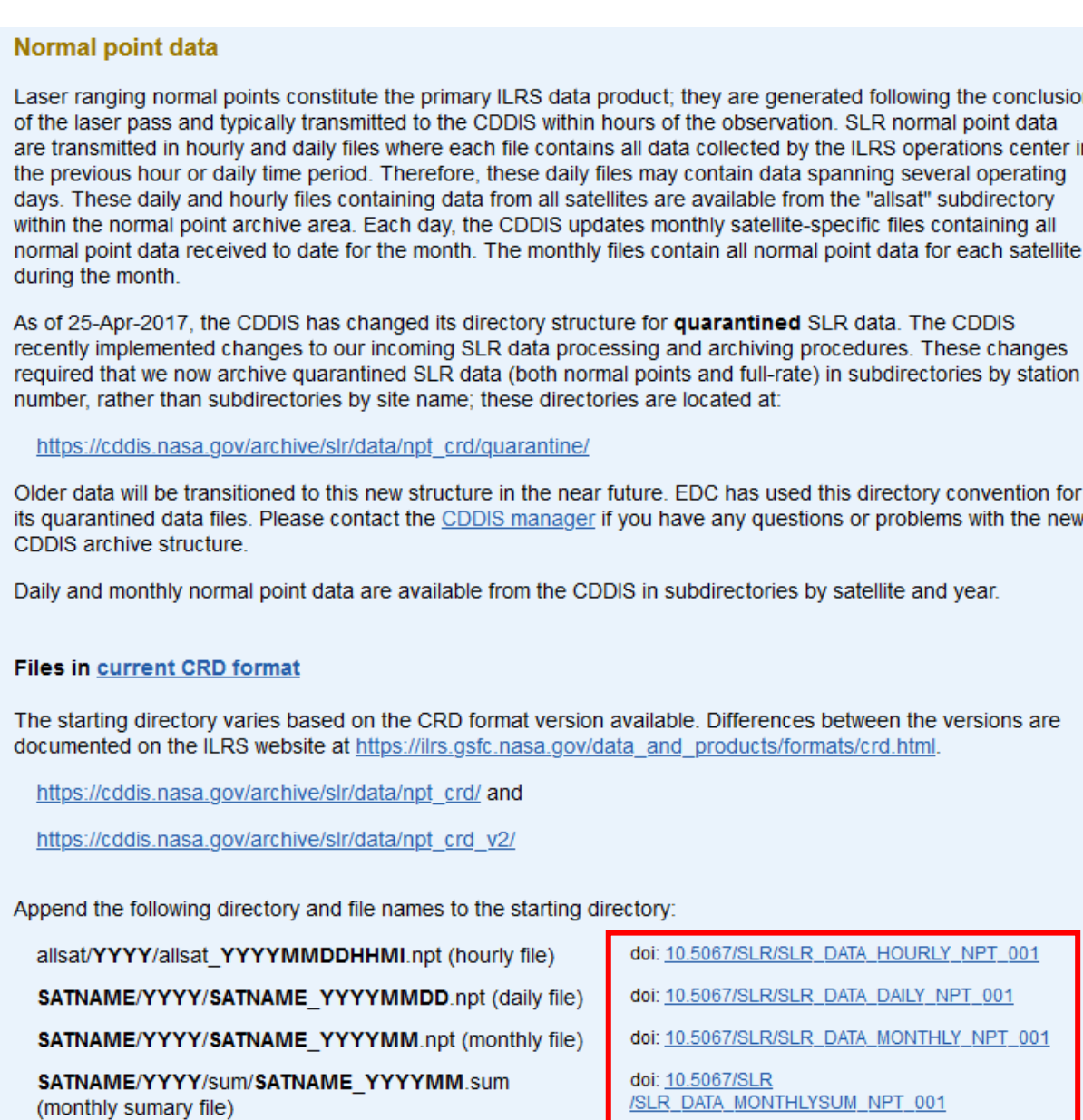


Figure 7: Sample Page that Requires Additional Navigation to Reach the Landing Pages



Figure 8: Sample Landing Page

For more information on citing our data:

