GNSS SOFTWARE IT PERSPECTIVE

EPOSS GNSS Ddata and Products

A Thematic Core Service (TCS)
of the
European Plate Observing System (EPOS) project

Webinar 2021

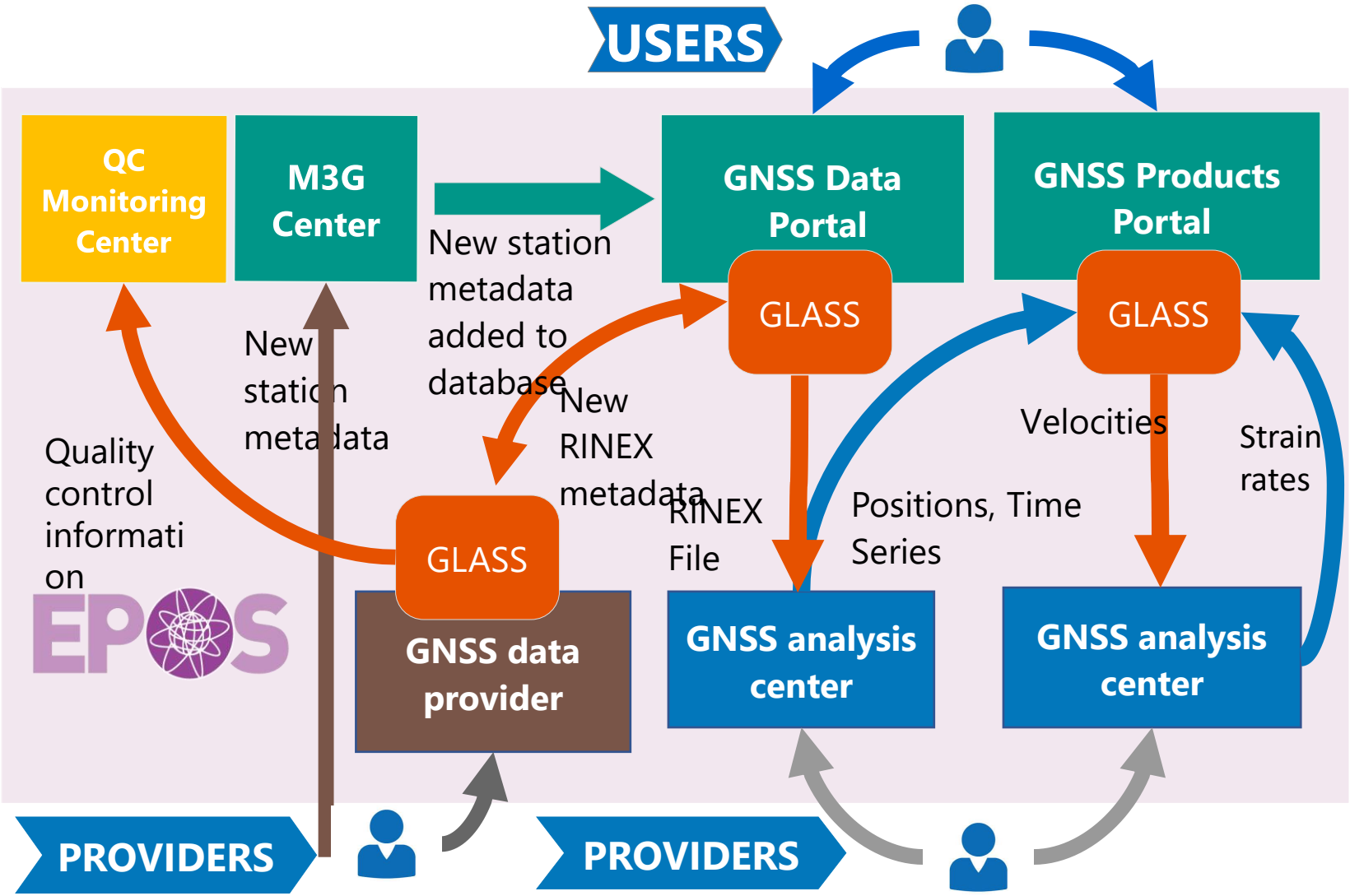
GLASS : OVERVIEW

GLASS (Geodetic Linkage Advance Software System)

- A **software package** developed in the EPOS project as an overall tool for GNSS data and products (and associated metadata).
  - Collect, Validate and Disseminate
- Based on a concept of **virtual integration** of distributed repositories where GNSS data (and products) are physically stored.
  - The **integration** is practically realized by the metadata management and dissemination operations.
  - **data redundancy** by integration of existing physical repositories as avoids single point of failure and provides **robustness**.
    - Primary / Secondary / Mirrored Repositories
- **data monitoring** and **data quality control**.
- Provides **independency** as a GLASS node can be functionality separated from existing GNSS repositories.

GLASS : Design Choices

- Centralized Submission and Validation of metadata (M3G)
- Quality Control (QC) tools;
  - Users only have access at the Portals to High Quality Data and Products
- *Local Data repositories keep full control of ALL RINEX files*
  - Tools to guarantee synchronization and consistency of the databases;
  - Tools to guarantee redundancy and uniqueness of data and metadata.


USERS
QC Monitoring Center
M3G Center
New station metadata added to database
GNSS Data Portal
GNSS Products Portal
GLASS
GLASS
New station metadata
New RINEX metadata
Velocities
Strain rates
Quality control information
RINEX File
Positions, Time Series
GLASS
GNSS data provider
GNSS analysis center
GNSS analysis center
PROVIDERS
PROVIDERS

OVERVIEW : GLASS INSTALLATIONS

Home / Data Availabilty / Data Node Maps / DGW

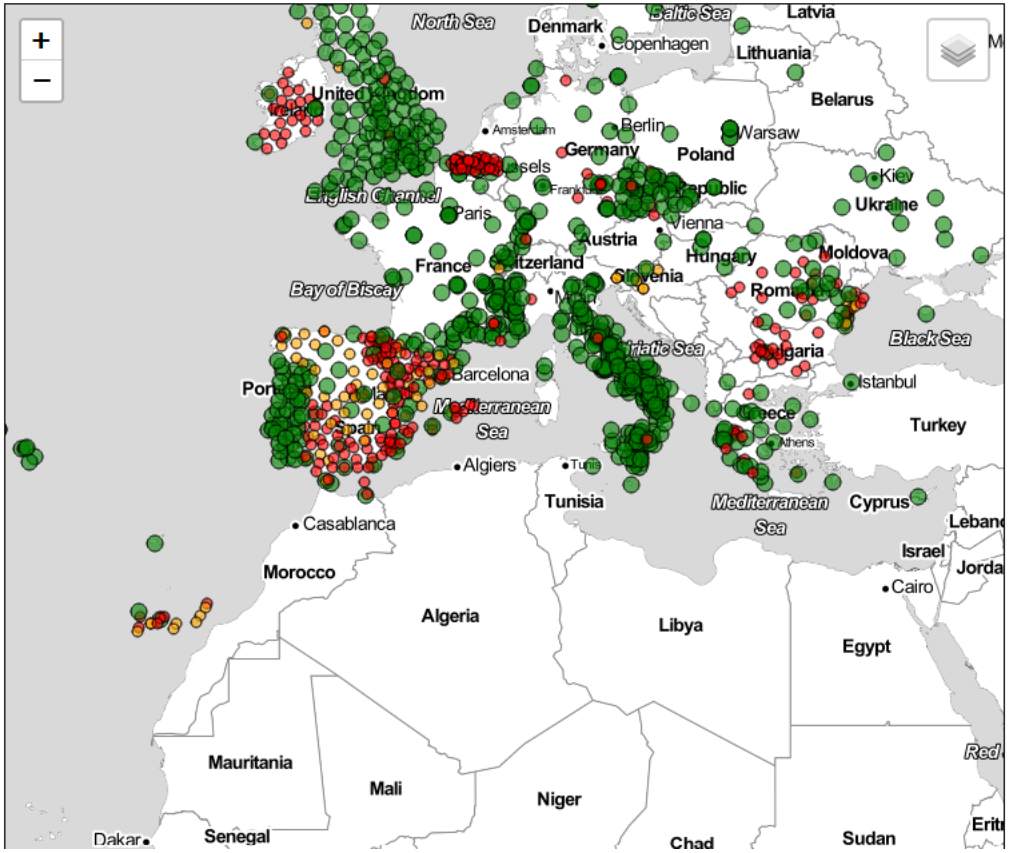
Data Node Maps / DGW

This web page gives an overview of the RINEX data discoverable from the **EPOS GNSS Data Portal** as well as from each of the individual **EPOS GNSS Data Nodes**.
Fully operational and pre-operational GNSS Data Nodes are accessible (unlike the planned ones).

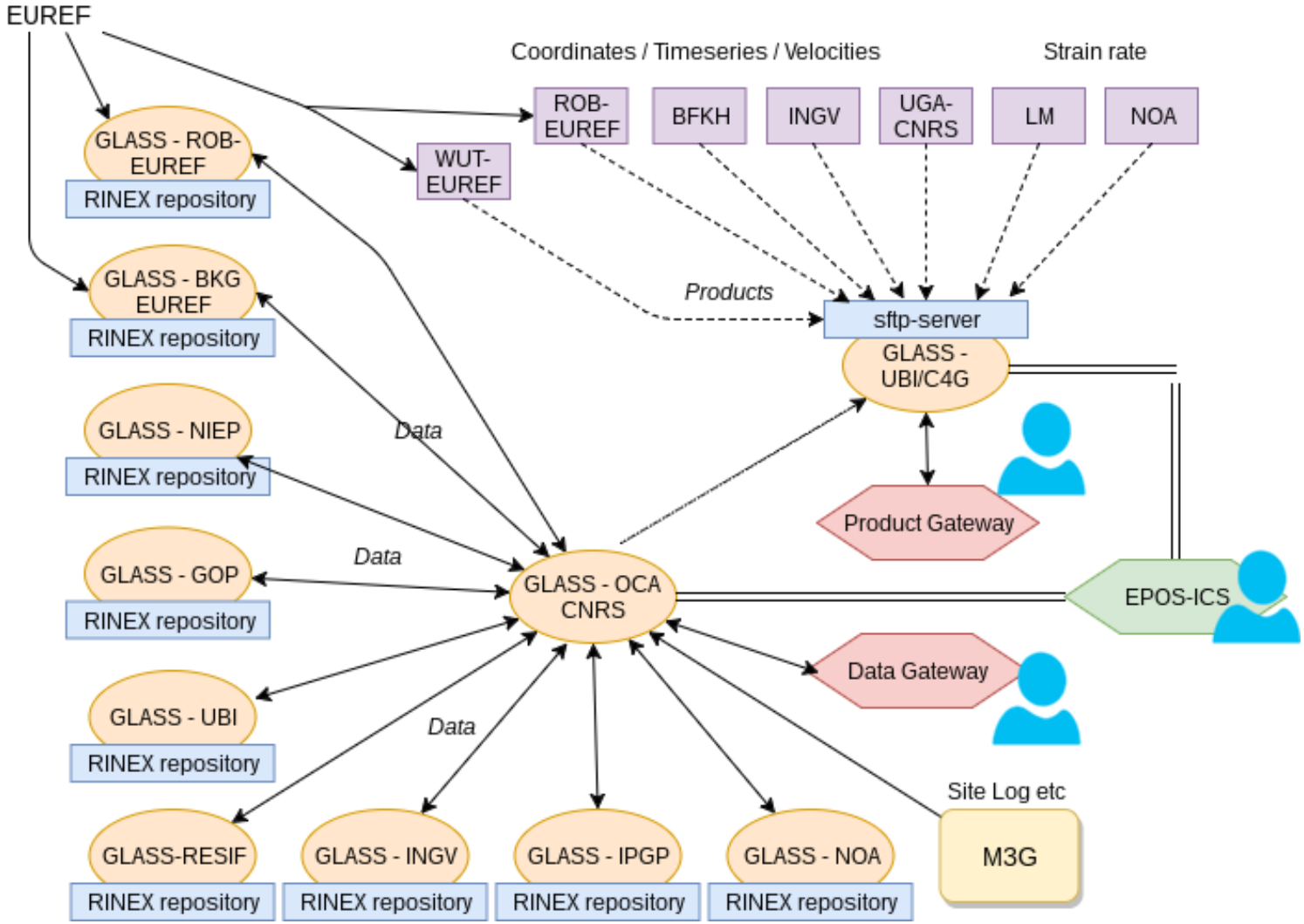
EPOS GNSS Data Portal		
DGW	FRA	http://gnssdata-epos.oca.eu:8080

EPOS GNSS Data Nodes		
C4G	PRT	https://glass.c4g-pt.eu:8081
CzechGeo	CZE	http://vm-epos.pecny.cz:8080
French-node	FRA	http://gnssdata-fr.oca.eu:8080
GLASS-EE	EST	https://glass-node.maaamet.ee
IGE	ESP	https://192.148.213.60:8080
INGV	ITA	http://glass.ingv.it:8080
IPGP	FRA	http://glass.ipgp.fr:8080
NIEP	ROU	http://gnss.infp.ro:8080
NOA	GRC	http://194.177.194.250:8080
Pan-European	PRT	https://glass.gnss-epos.eu
ROB-EUREF	BEL	http://eposvm-as.oma.be:8080

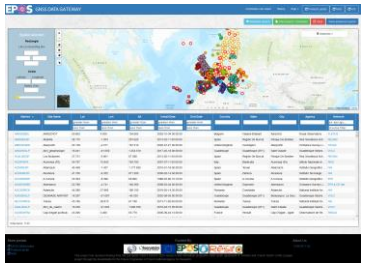
1145 EPOS Stations at DGW
746 stations with more than 30 days of RINEX data
74 stations with less than 30 days of RINEX data
325 stations without RINEX data

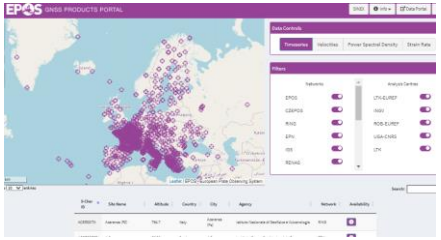


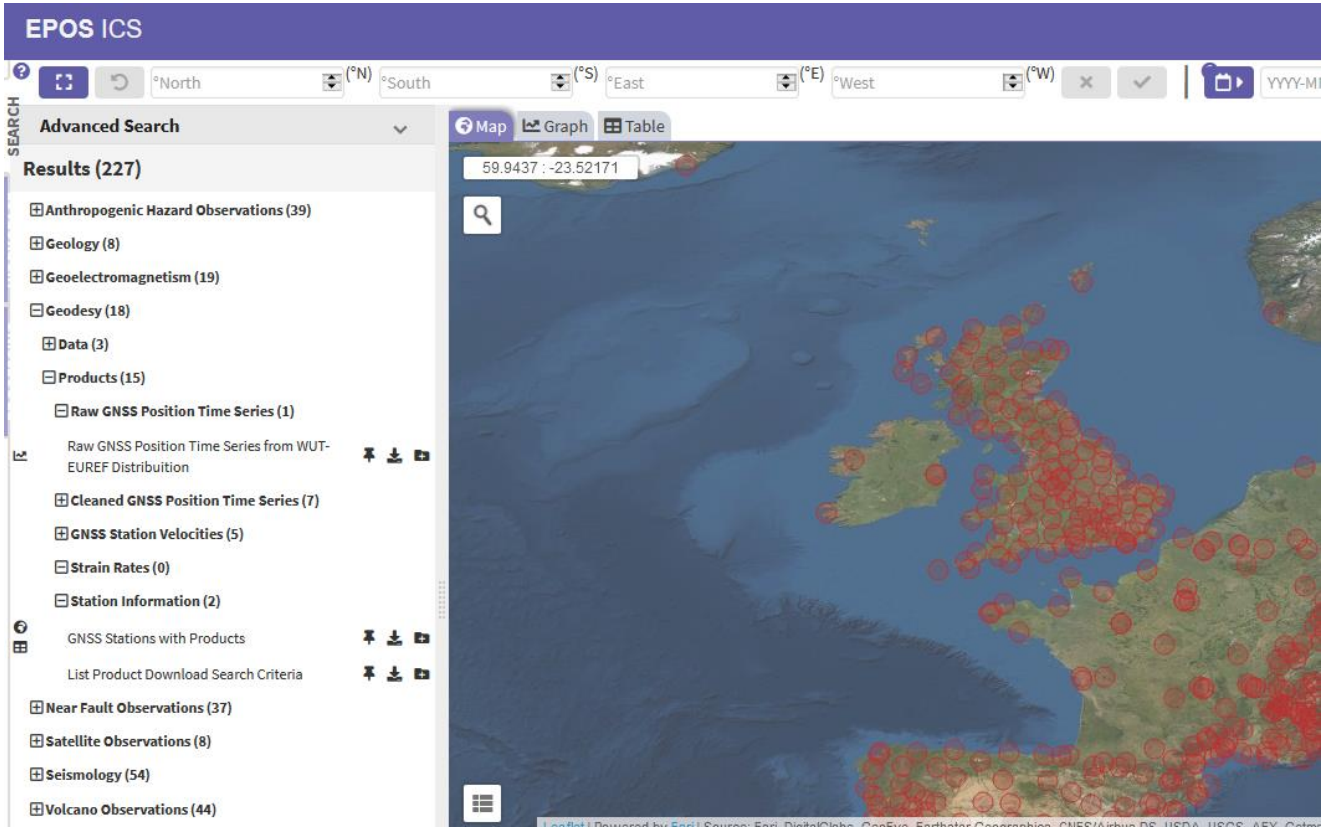
Overview : GLASS Installations (old slide)



OVERVIEW : MAIN USER PORTALS







OVERVIEW : GLASS SOFTWARE COMPONENTS

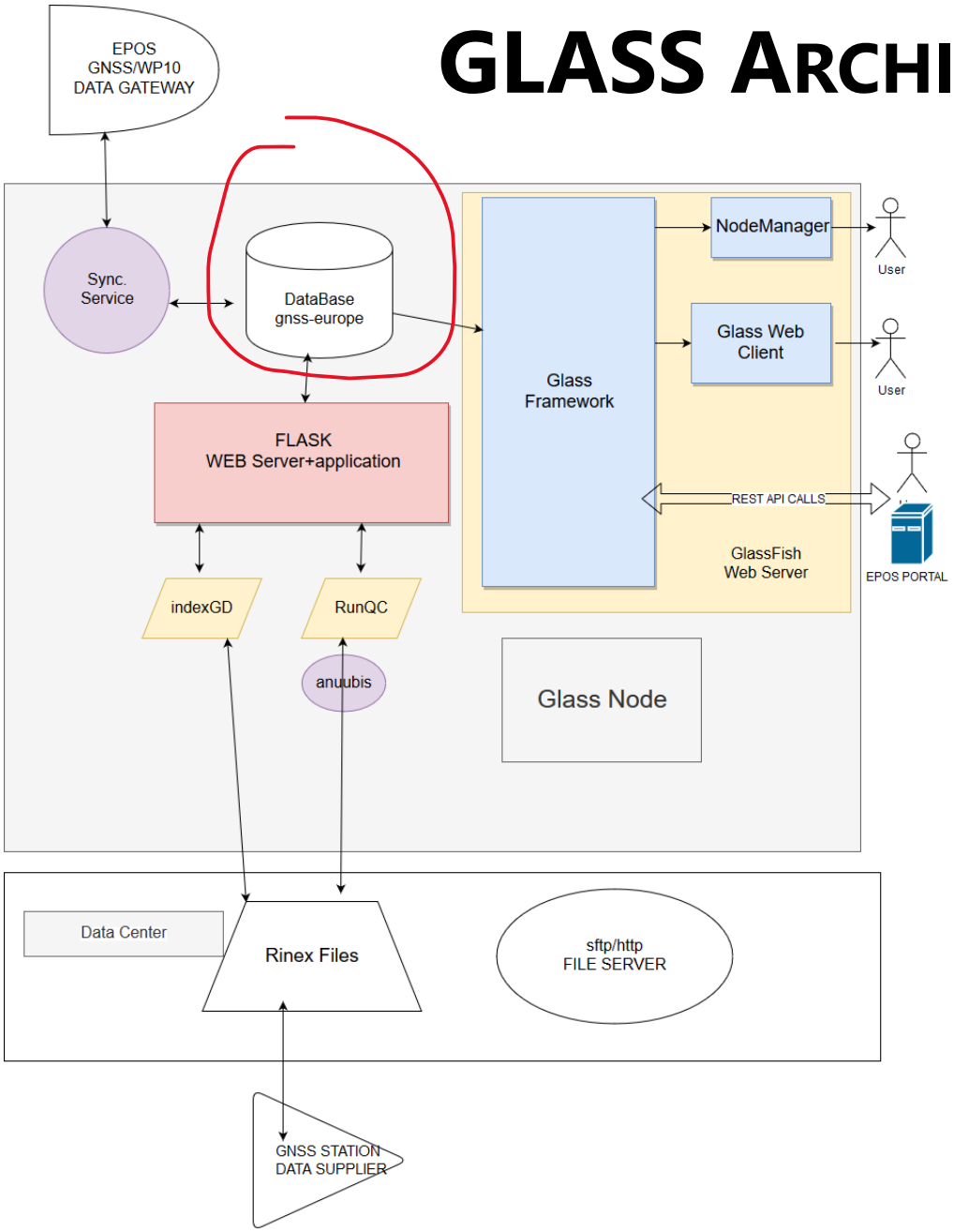
- Common DataBase Structure

- Metadata describing network topography, characteristics and connections (T0)
- GNSS Station metadata e.g station name, antenna details,.. (T1)
  - Based on IGS log file
- Rinex file metadata e.g creation date, md5, url, .. (T2)
- Rinex file quality data e.g status, constellations, .. (T3)
- Product data (T4,T5,T6)
  - Raw & Cleaned Position and Position TimeSeries, Velocities and Strain Rates

- **Glass Node** – Servers and Software to to manage, validate, and distribute GNSS data & metadata and associated products.

- **Data Centre** – responsible for storing and serving Rinex files
  - File Server - https(s), ftp, sftp,

GLASS ARCHITECTURE



DATABASE

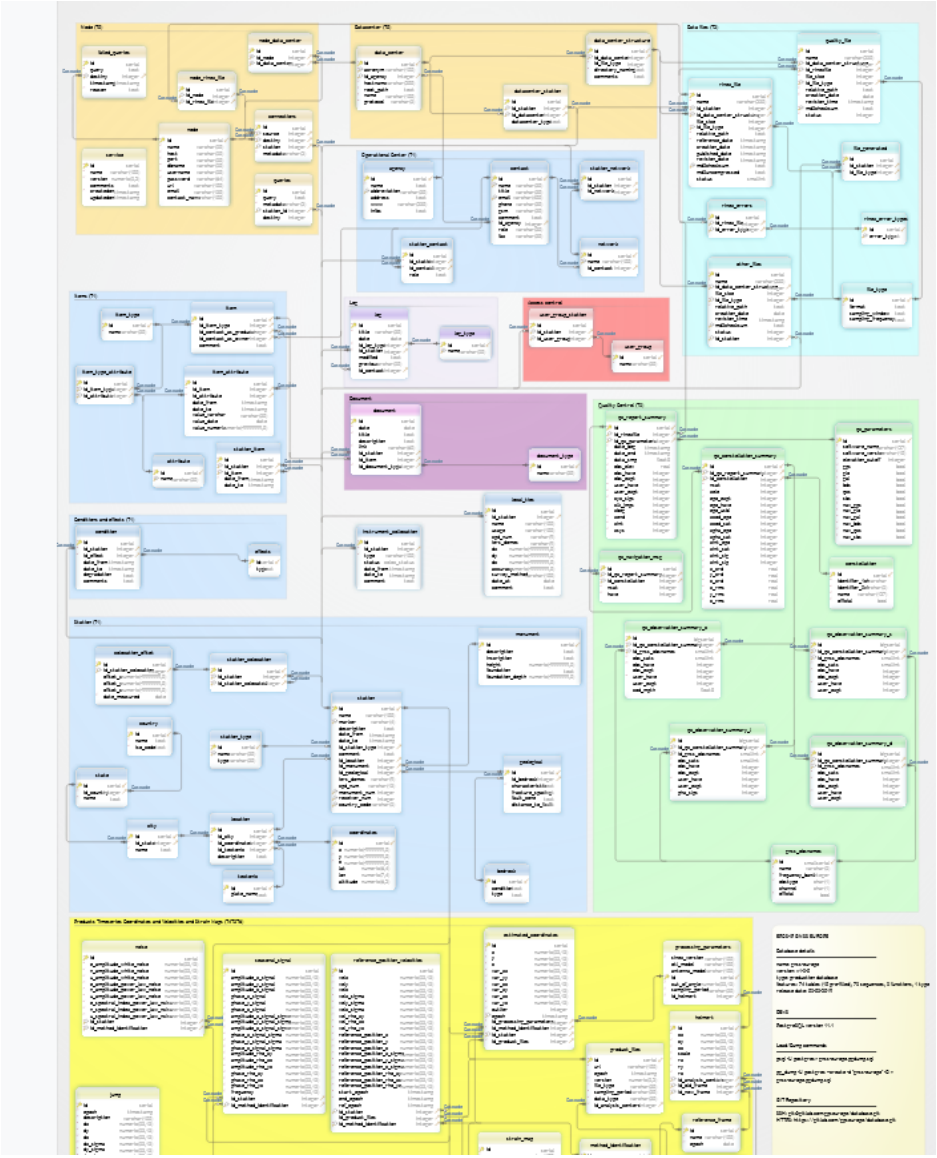
The GLASS database

POSTGRESQL (10.7+)

1 SQL Tables

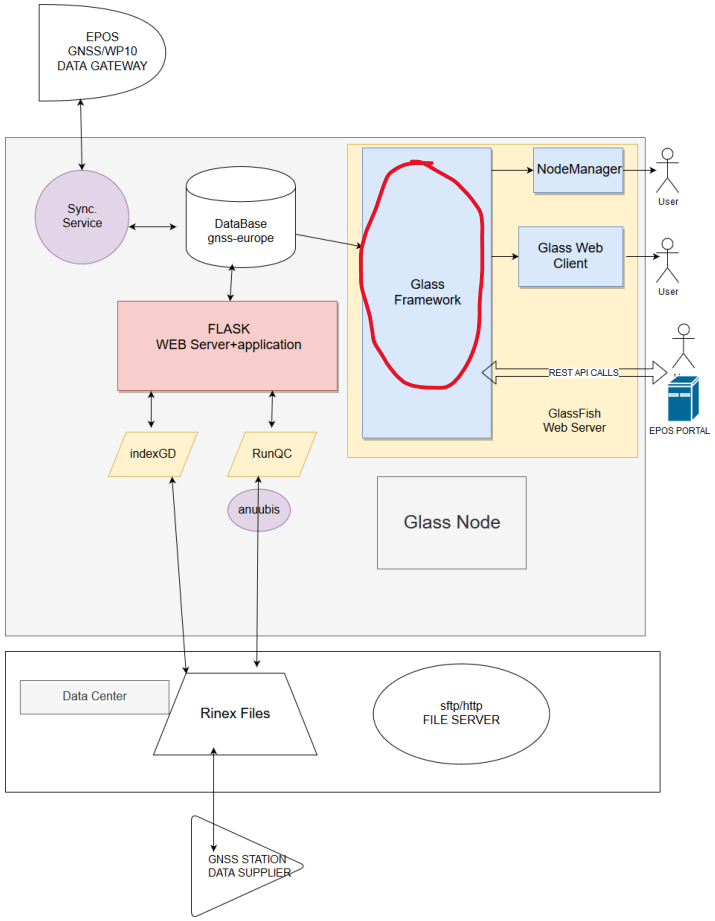
2 Table Triggers

for use in the synchronization process



GLASSFRAMEWORK API

- **REST API**
- **Disseminates** GNSS station and Rinex file metadata via a REST API Web Application
  - Java Platform, Enterprise Edition
  - Swagger documentation
    - http://gnssdata-epos.oca.eu:8080/GlassFramework/
  - By default **Glassfish Java EE Container**
    Can also compile for : Apache / NGINX etc
- Other **Web Applications (ANGULAR/Nodejs**)
  - Optional (strongly advised) Web Application GLASS WEB CLIENT GUI
    - **GUI for visualizing and searching**
  - Optional Web Application *Node Manager*
    - Manages the Node & Datacentre details



glass.epos.ubi.pt:8080/GlassFramework/

GLASS-API Framework (Version 1.4.0) WebUI

GNSS: Node Service Agreement

View SA

See service agreement

EPOS Links

- EPOS WP10 Central Bureau
- EPOS GNSS Data Gateway Portal
- EPOS GNSS Products Portal
- EPOS GNSS M3G
- EPOS ICS Demonstrator Portal
- EPOS Project

API and Developer Info

Developer Information

See Version, Version date and build date and Cache Information

The Change List for this APP

Browse the API Locally

Use Swagger UI to view requests

The WP10 Reference Swagger API @ SWAGGERHUB

Swagger UI | gnssdata-epos.oca.eu:8080/Glas

glass.epos.ubi.pt:8080/GlassFramework//webjars/swagger-ui/3.2.0/?url=https://glass.epos.ubi.pt:8080/Gl...

GET /stations/v2/agency/{agency}/{size}/{format}

GET /stations/v2/antenna/{antenna}/{size}/{format}

GET /stations/v2/city/{city}/{size}/{format}

GET /stations/v2/combination/{size}/{format}

GET /stations/v2/coordinates/{area}/{size}/{format}

GET /stations/v2/country/{country}/{size}/{format}

GET /stations/v2/date/{date_from}/{size}/{format}

GET /stations/v2/list/station

GET STATION LIST V2 - Returns a list with the name and marker of all the stations or the ones that match the given parameters.
Optional parameters are:

- epos
- marker
- name

This can be passed as: **name=Blieux** or **marker=BLIX,CASC** or **epos=non-epos**
Different parameters should be separated by **&** (AMPERSAND)
Multiple values for a parameter should be separated by , (COMMA)

Parameters | Try it out

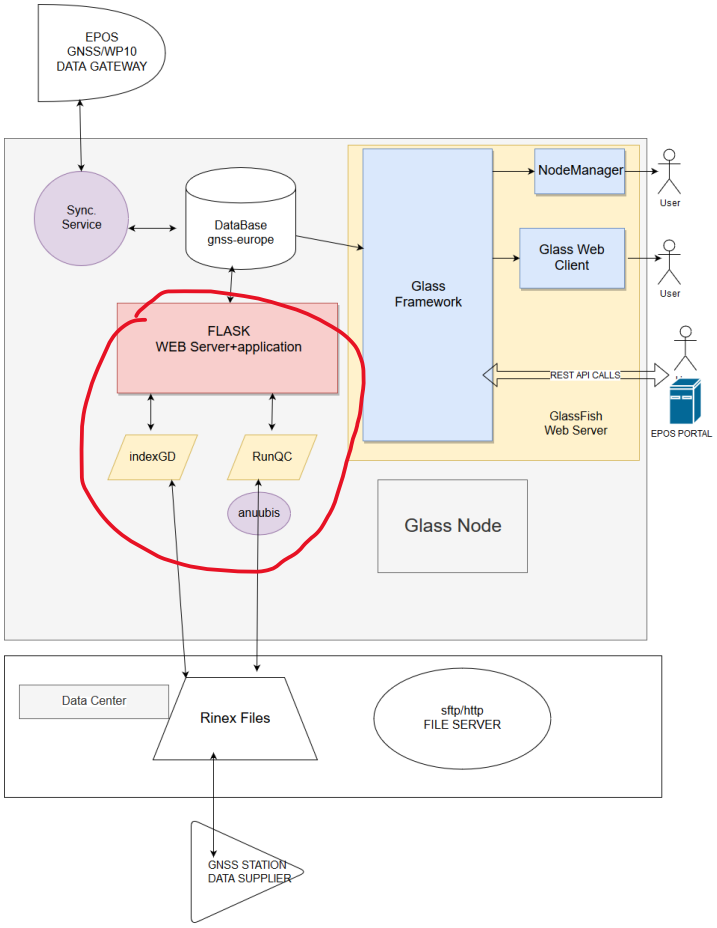
META DATA INSERTION

- Only the EPOS DATA GATEWAY needs to insert station metadata (T1)
- Glass Nodes only insert RINEX file metadata (T2) and Quality data (T3)

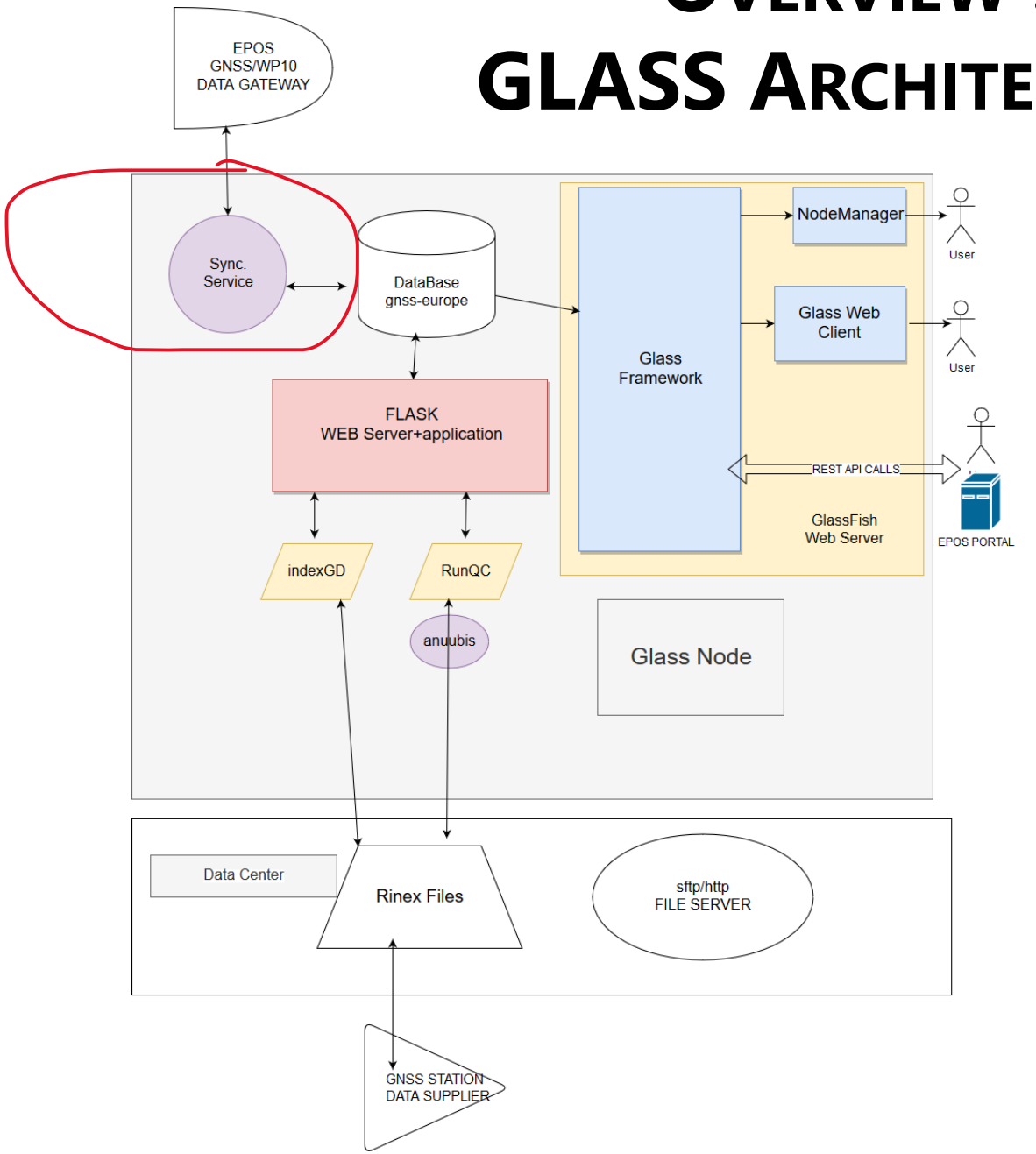
- **FWSS**
  - A **Python** Web Application Running in a FLASK (or other) Server to insert metadata into the database. API to insert into database.

- **Insertion of Rinex File Metadata**
  - Extraction and Insertion is done by **python** scripts called **indexGD**

- **insertion of Quality Data (T3)**
  - Extraction and Insertion by **perl** scripts called **RunQC**
  - Calls **ANUBIS (c++)** analyses the RINEX file Quality

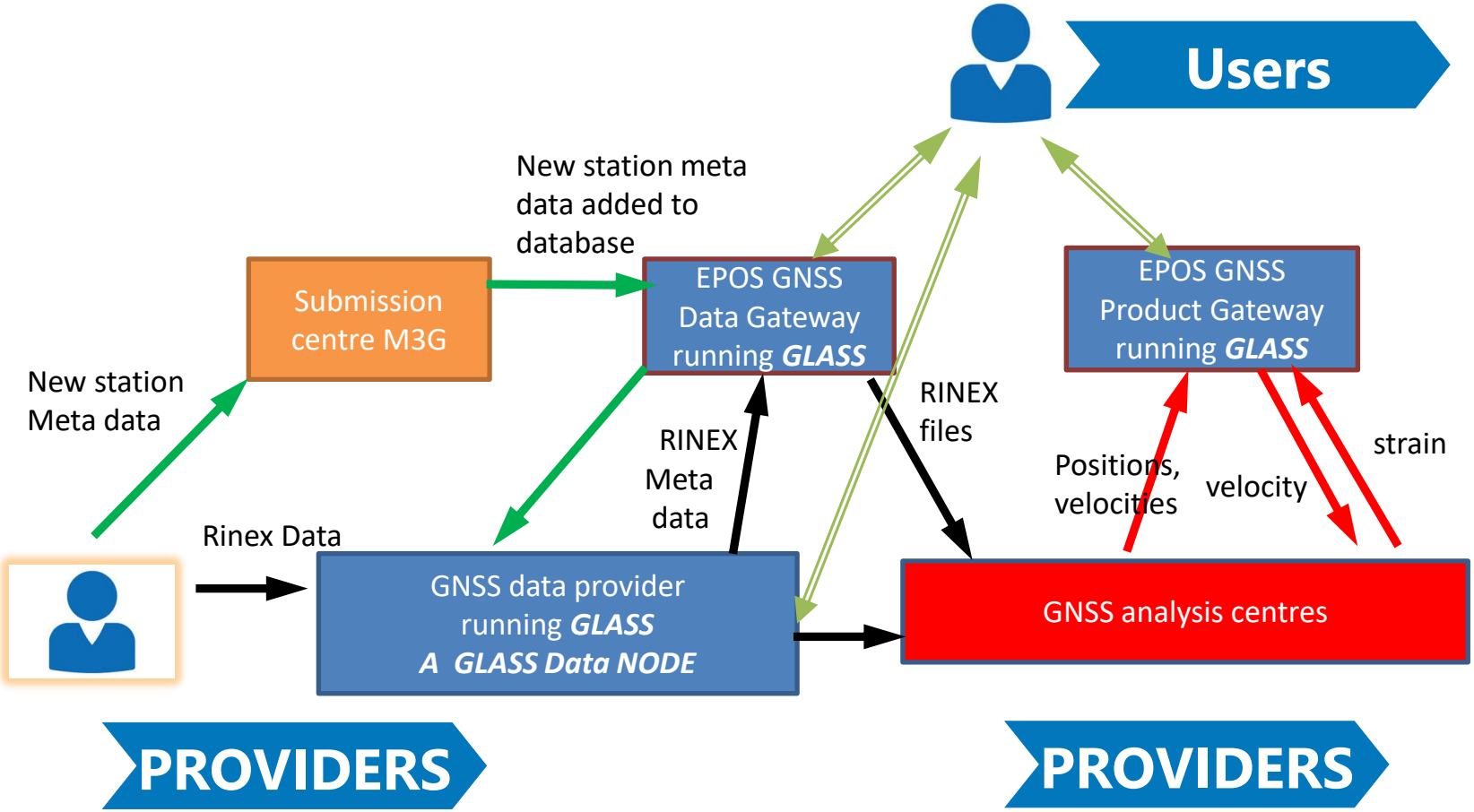


OVERVIEW : GLASS ARCHITECTURE



META DATA SYNCHRONIZATION

- A **<u>java tool / service</u>** for synchronizing metadata between databases
  - T0 & T1 → **<u>flows down</u>** to local nodes from the DGW
  - T2 is generated at local nodes **<u>flows up</u>** to the DGW
  - T3 quality information is **NOT** synchronized but remains held locally.
- Ownership policy
  - RINEX files are held **<u>locally</u>** at the local GLASS Node
    - only metadata is shared with the Data Gateway
      - Only High Quality Rinex file data is available at the DGW
      - Bad Quality Rinex file stays on the node
  - The local node **<u>Must</u>** disseminate the Rinex files publicly
    - via https/sftp..
  - When a user searched GLASS for a stations Rinex files the Glass Node API's only supplies "url's" of these Rinex Files


Users
New station meta data added to database
Submission centre M3G
EPOS GNSS Data Gateway running GLASS
EPOS GNSS Product Gateway running GLASS
New station Meta data
RINEX files
RINEX Meta data
Positions, velocities
velocity
strain
Rinex Data
GNSS data provider running GLASS
A GLASS Data NODE
GNSS analysis centres
PROVIDERS
PROVIDERS

GLASS repositories

PRIMARY

- Decided by the data provider of station which is also responsible for T1 updates;
- The primary repository is used for the default filtering of the files when querying from the data gateway (or any another portal that lists the station).

SECONDARY

- Not linked specially to any primary repository (no processes have been implemented in GLASS in order to guarantee that the files are the same at the different repositories)
- T2 and T3 are generated locally at secondary repositories and populated to the databases T2 and T3.

MIRROR

- Some repositories could have agreement and a repository can act as a mirror of another repository (the GLASS system will guarantee that the RINEX files are the same at both repositories);
- Also in this case T2 and T3 must be generated locally and populated to the DB;
- The file is refused if it is different from the file on the primary repository.
- The mirrored file cannot be changed locally.

Note: a station can have only one primary repository but can have several secondary repositories and/or several mirror repositories.

Operational processing
T2/3 Rinex file Processing

- Script to parse and insert data : **indexGD**
  - Contains many options for processing daily and historical data
- Script to parse and insert quality data : **RunQC**
  - Contains many options for processing daily and historical data

- Standardized processing and control flow
  - https://gitlab.com/gpseurope/DailyProcedures
  - For daily processing of Rinex files arriving at a ***bucket*** directory

- Other processing Tools
  - https://gitlab.com/gpseurope/gnss_indexer

GLASS Description and Components

- **Background**
  - it is loosely based on the original GSAC (Geodetic Seamless Archive Centers) concept
- **Requirements**
  - a Linux Server and Internet access
  - CentOS 7 8GB RAM
- **Licensing**
  - the GLASS package is open source (Creative Commons)
- **Distributed Architecture**

  May install components over several boxes

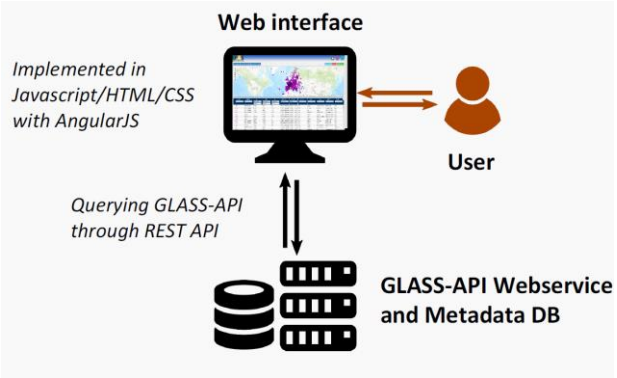
  DataBase Server

  Web App Server (GlassFish)

  Python Web App Server (flask)

  Python and Perl Scripts

  Java and C++ Applications



Software Repo : https://gitlab.com/gpseurope

gitlab.com/gpseurope

GitLab | Projects | Groups | Snippets | Help | Search or jump to...

gpseurope

Group overview
Details
Activity
Issues 71
Merge Requests 3
Packages & Registries
Members

Collapse sidebar

gpseurope

gpseurope
Group ID: 901630

Subgroups and projects | Shared projects | Archived projects | Sear

- **DailyProcedures** — Standard Rinex File work Flow Processing for EPOS
- **database** — Database schema for Geodetic station, data and quality information.
- **EPOS_GLASS_Framework** — Tool that handles all the requests that feed data and metadata to the Data Gateway (DG...
- **EPOS_Sync_System** — Tool for handling the synchronization tasks between machines/nodes in the EPOS GNSS...
- **FWSS - Flask Web Service Server** — FWSS is a Lightweight Web Service implemented with Python Flask Web server. This sol...
- **GLASS-web-client** — New version GLASS web client
- **gnss_indexer**
- **indexGD** — indexGD is a python program to index geodetic data by the means of scanning through...
- **RunQC**
- **test data and tools** — tools and data for local node testing

INSTALLATION PROCESS

- LINUX Centos7 or other
  - Install JRE, JDK, python 2.7 and 3 and pip, perl, c++ and c compilers, git etc

- Install Postgresql server
  - Install **DataBase**
  - Load database tables
  - Activate database triggers for synchronization (now or later)

- Install GlassFish Web Server and applications
  - **Glass API war file**
  - optional GUI and NodeManager war files

- Install **fwss** Python (flask) Web Server and Application

  - Install Rinex File MetaData Extraction
    - Install **indexGD** scripts

  - Quality Software
    - Install **ANUBIS** GNSS Quality Software http://software.pecny.cz/anubis
    - Install hakanaka compression (CRX2RNX) http://terras.gsi.go.jp/ja/crx2rnx.html
    - Install **RunQC** scripts

- Install Java **Synchronization Service**

- Install and test with the Node testing software and data

- All software - GitLab @ https://gitlab.com/gpseurope/

Installation Procedure

- Test Your Local Installation
  - Install software and run test tools

- EPOS Installation
  - Install station metadata at M3G
  - Install synchronization service
  - Wait for sync from EPOS data gateway node
    - Synchronize station metadata (T1)
  - Insert RINEX file metadata at local node
    - Synchronize RINEX file metadata (T2)

- GUIDELINESFOR SETTING-UP AND OPERATING AN EPOS GNSS DATA NODE
  - https://gnss-metadata.eu/Guidelines/EPOS-GNSS_GLASS_Node_Guidelines.pdf

- Software Installation
  - **https://docs.google.com/document/d/1AllZ5vI-SFUrtKqGJsAARi5cibuB8zFmXL-O8K-X4wY/edit?usp=sharing**

INSTALLATION

Virtual Machine https://www.c4g-pt.eu/eposvm/

c4g-pt.eu/eposvm/

EPOS

Virtual Machine

EPOS VM Files for Testing and Development

Please read the Document "Using the virtual machine" available here

To Quickly Configure Guest IP and DEMO here

Aprox. 3GB

VM .box file Last Modified: January 14 2021 09:40:59.

VM .ova file Last Modified: January 14 2021 09:56:49.

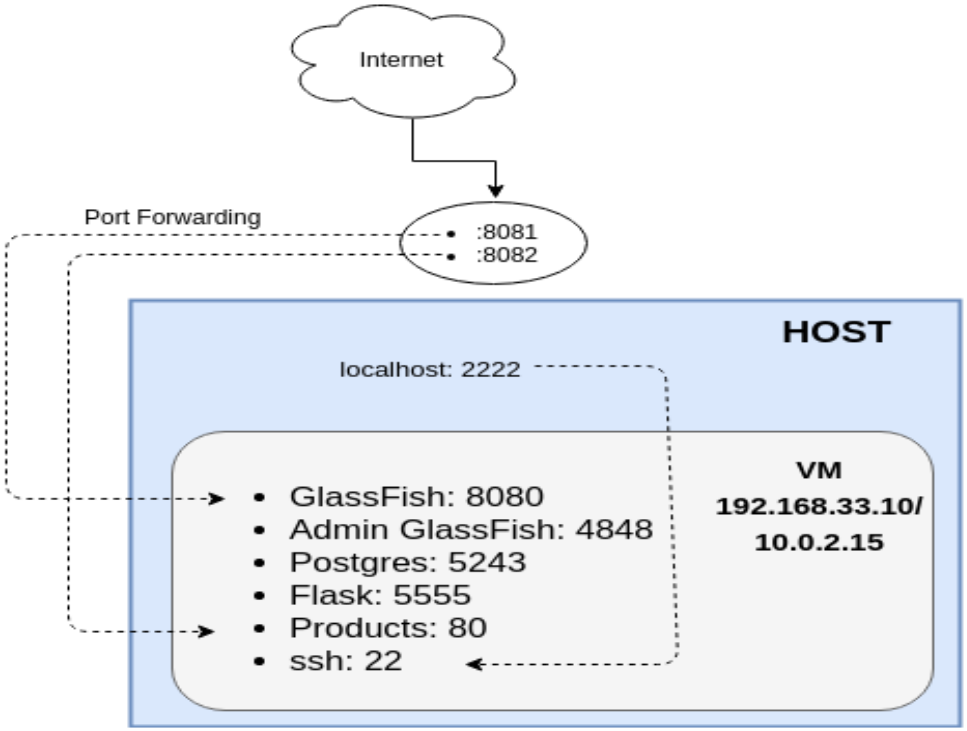
EPOS VM Files for Deployment

Virtual Machines That Contain Minimal Software necessary for an EPOS WP10 Glass Node. Aprox. 3GB

VM .box file Last Modified: January 14 2021 09:40:59.

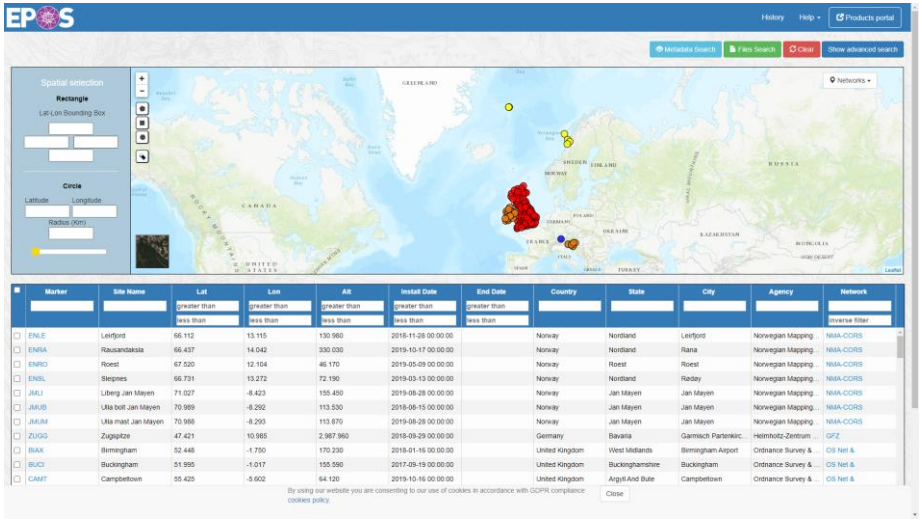
VM .ova file Last Modified: January 14 2021 09:56:49.

VM NETWORKING



GLASS PanEuropean Node

- GLASS Node for any providers that are not hosting their own node
- Stations metadata and RINEX files freely available through the web UI or CLI
- Daily updated RINEX Files stored in the datacentre which may serve as a backup for the data provider
- Synchronized and Made Available the Data Gateway Portal (DGW)



- **Glass Node** – https://glass.gnss-epos.eu
- **Data Centre** – https://datacenter.gnss-epos.eu

CONTACTS

Software

In general Please use the gitlab – issues

For installing an EPOS Glass Node

- **Jean-Luc Menut menut@geoazur.unice.fr**

Software

- **Paul Crocker crocker@segal.ubi.pt**
- **José Manteigueiro jose.manteigueiro@c4g-pt.eu**

MORE INFORMATION

Project Pages

EPOS GNSS https://www.epos-ip.org/tcs/gnss-data-and-products

GNSS Europe Landing Page https://gnss-epos.eu/

Services

Data Providers : M3G https://gnss-metadata.eu/

Users : DATA Gateway

Portal http://gnssdata-epos.oca.eu/

Demo Video https://www.youtube.com/embed/f54nIliid5U

Users : PRODUCTS Portal

Portal https://gnssproducts.epos.ubi.pt/

Demo Video https://www.youtube.com/embed/PpJyfFfCSkQ