# The Morumotto / Sicaqo project

Olivier Geber, Constanza Pardo, Jean-Marie Saurel, Arnaud Lemarchand, Philippe Kowalski, Nicolas Leroy, El-Madani Aissaoui, Claudio Satriano

# Morumotto

**MO**dular a**R**chive b**U**ilder from Multiple **O**rigin **T**emporal **T**races (& **O**ther stuff)

Authors : Olivier Geber, Constanza Pardo, Jean-Marie Saurel, Arnaud Lemarchand, Philippe Kowalski, Nicolas Leroy, El-Madani Aissaoui, Claudio Satriano

Abstract : **Morumotto** (former SiQaCo project) is a tool that automatically fills a seismic data archive, **corrects overlaps and requests data to fill the gaps**. Data are regularly fetched from a pool of different sources. It also performs data **quality control**. This software is to be used by **network operators.**

The software was designed to be able to **integrate new sources plugins** (to be able to fit any kind of Seismic Network) and new data format/structure in the future.

## Beta version available

► Source code available on GitHub (*) :

**github.com/IPGP/morumotto**

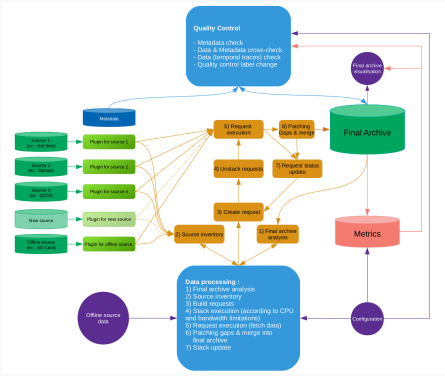
## Work flow

### Data update

► Read final archive, create gaps index
► Get source inventories
► Create requests from a pool of sources
► When stack is ready, execute it as multithreaded background task
► Clean data, remove overlaps, then merge it to final archive (see below : request algorithm)
► Update final archive statistics

### Stack management

► Each source has a priority, data coming from higher priority source will be favoured
► Limitations in local or distant CPU and bandwidth can be modified to fit networks specificities
► Tasks are handled either manually or running automatically in a **crontab**



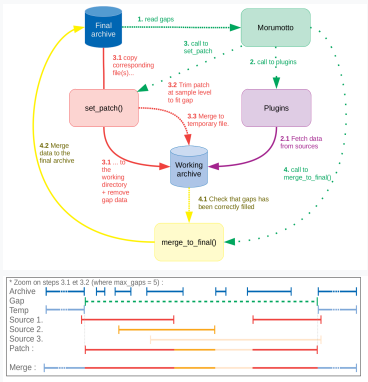

### Quality control

► Check metadata
► Check data quality
► Check waveforms vs metadata
► Check station location
► Plot instrument response
► Plot data completion

### Request algorithm

1. Morumotto read gaps in final archive

FOR EACH GAP :
----------Encapsulated in a request----------
2. Morumotto calls plugins
2.1 plugins fetches data corresponding to the gap (=patch) from several sources and copy them into the working archive, in a temporary directory linked to the request
3. Morumotto calls set_patch()
3.1 set_patch() copies files concerned with the gap from the final archive to the working archive, then trims them to remove potential data between gap start and end (in case several gaps have been merged into a bigger one)
3.2 set_patch() merges patched data, givin more importance to higher priority source data, into a final patch that fits-on sample level-the gap*
3.3 Merge final patch to temporary file(s) (copied in step 3.1)
**In case of failure** : delete temporary data (unless debug_mode is ON), request status is set to « failed »
4. Morumotto calls merge_to_final()
4.2 merge_to_final compares temporary file(s) with the corresponding file(s) in final archive and checks that no new gap nor data compression problem has been introduced
4.3 merge_to_final overwrites final archive file(s) with the temporary file(s)
**In case of failure** : delete temporary data (unless debug_mode is ON), request status is set to « failed »
----------End of request----------
5. Morumotto cleans requests




## Software

### Design

► Object oriented
► Modular:
- New plugin integration is easy
- New data & metadata formats can be added

► Works indifferently from data format & structure
► Currently supports miniSEED, dataless SEED and stationXML (FDSN)
► For evenly sampled generic timeseries including-but not only-seismic data

### Implementation

► Built with **Django** framework, which includes a template system for the frontend and an **ORM** for the backend and **database management**
► Supported RDBMS: MySQL, PostgreSQL
► Algorithms for request creation and stack management are in **Python**, data quality control and data processing are done using the **Obspy** library
► Frontend includes several **Javascript** libraries (*Cal-heatmap*, *Datatables*, *Leaflet…)*
► Multithreading and background tasks is done with **Celery**, which has a specific django plugin
► Stack monitoring is done with **Flower**, a Celery monitoring tool
► Source plugin scripts are written in **Shell**

### Daemon, crontab, configuration

► The software is deamonized, so that it runs on the startup of the system (using **supervisor**)
► It currently uses the **crontab** to execute according to a frequency defined by the user
► *install.sh* script provided, tested in **Debian 9** and **Ubuntu** > 16.04
► First use of the software comes with an initialisation wizard

### License

► This program is free and open source, under the GNU General Public License version 3

## Command line interface

All data processing & configuration can be done by **command line.** Few examples :

► Create a request manually :

```
>$ python manage.py create_request starttime 2018-04-22T06:00:00Z endtime
2018-04-22T07:00:00Z nslc_list PF.PRO.00.HH? PF.RER.90.HHZ --source_list FDSNWS_IPGP
LOCAL_DIR_HOME
```

► Execute stack manually

```
>$ python manage.py exec_stack
```

► Update data for a specific window of time

```
>$ python manage.py window_update --window_starttime 2018-04-22T00:00:00Z window_endtime
2018-04-28T00:00:00Z
```

## Plugins

► New plugins can be easily integrated into the software
► FDSN Webservice plugin code :

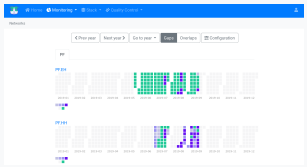
► On the left : I/O (always the same),
► On the right : **the part that needs to be modified to fetch data from a new source**
► Then create a new class in *source.py* :

*Yes, that's the* ***full*** *class definition*

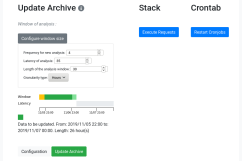
## Interface

### Web interface

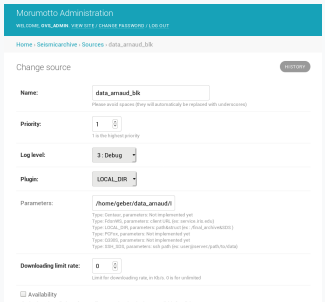
► Morumotto is running on a **server**, users can access it with a classical **web browser**
► Administration interface for configuration
► Different **user levels** : normal, advanced and admin
- Normal user can monitor network gaps, overlaps and perform quality control (not affecting data)
- Advanced user can create data requests, change update settings and statistics
- Admin can configure, add & delete requests, statistics, users, etc.



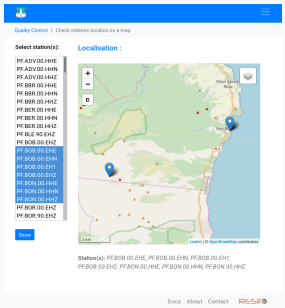
Monitoring interface : daily gaps per component view




Configuration




Administation panel : source plugin configuration




QC interface : station location view

## Development

### Calendar

► Functional specification & design dossier shared with RESIF community in April & September 2018
► Available on github :
- github.com/IPGP/sigaco/blob/master/CDC_ValidationDonnees.pdf
- github.com/IPGP/sigaco/blob/master/SiQaCo-Dossier-de-conception.pdf

► Development from Sep. 2018, involving RESIF, volcano observatories from IPGP community & Geoscope

### Perspectives

► (*) Release candidate version will be pushed to the RESIF GitHub
► Source plugins currently under development : Centaur, Q330, NAQS
► Quality Control currently under development
► Installation & testing in observatories & RESIF
► API & Documentation in progress