# Recent advances in the Lesser Antilles observatories
# Part 1 : Seismic Data Acquisition Design based on EarthWorm and SeisComP

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Lesser Antilles observatories are in charge of monitoring the volcanoes and earthquakes in the Eastern Caribbean region.

During the past two years, our seismic networks have evolved toward a full digital technology. These changes, which include modern three components sensors, high dynamic range digitizers, high speed terrestrial and satellite telemetry, improve data quality but also increase the data flows to process and to store. Moreover, the generalization of data exchange to build a wide virtual seismic network around the Caribbean domain requires a great flexibility to provide and receive data flows in various formats.

As many observatories, we have decided to use the most popular and robust open source data acquisition systems in use in today observatories community : EarthWorm and SeisComP.

The first is renowned for its ability to process real time seismic data flows, with a high number of tunable modules (filters, triggers, automatic pickers, locators). The later is renowned for its ability to exchange seismic data using the international SEED standard (Standard for Exchange of Earthquake Data), either by producing archive files, or by managing output and input SEEDLink flows.

French Antilles Seismological and Volcanological Observatories have chosen to take advantage of the best features of each software to design a new data flow scheme and to integrate it in our global observatory data management system, WebObs [Beauducel et al., 2004][1] , see the companion paper (EGU2010 - 5098 _ XL 294).

We assigned the tasks to the different softwares, regarding their main abilities :
- EarthWorm first performs the integration of data from different heterogeneous sources;
- SeisComP takes all this homogeneous EarthWorm data flow, adds other sources and produces SEED archives and SEED data flow;
- EarthWorm is then used again to process this clean and complete SEEDLink data flow, mainly producing triggers, automatic locations and alarms;
- WebObs provides a friendly human interface, both to the administrator for station management, and to the regular user for real time everyday analysis of the seismic data (event classification database, location scripts, automatic shakemaps and regional catalog with associated hypocenter maps).

## fig 1. French Lesser Antilles Observatories – Global data acquisition and real time processing scheme
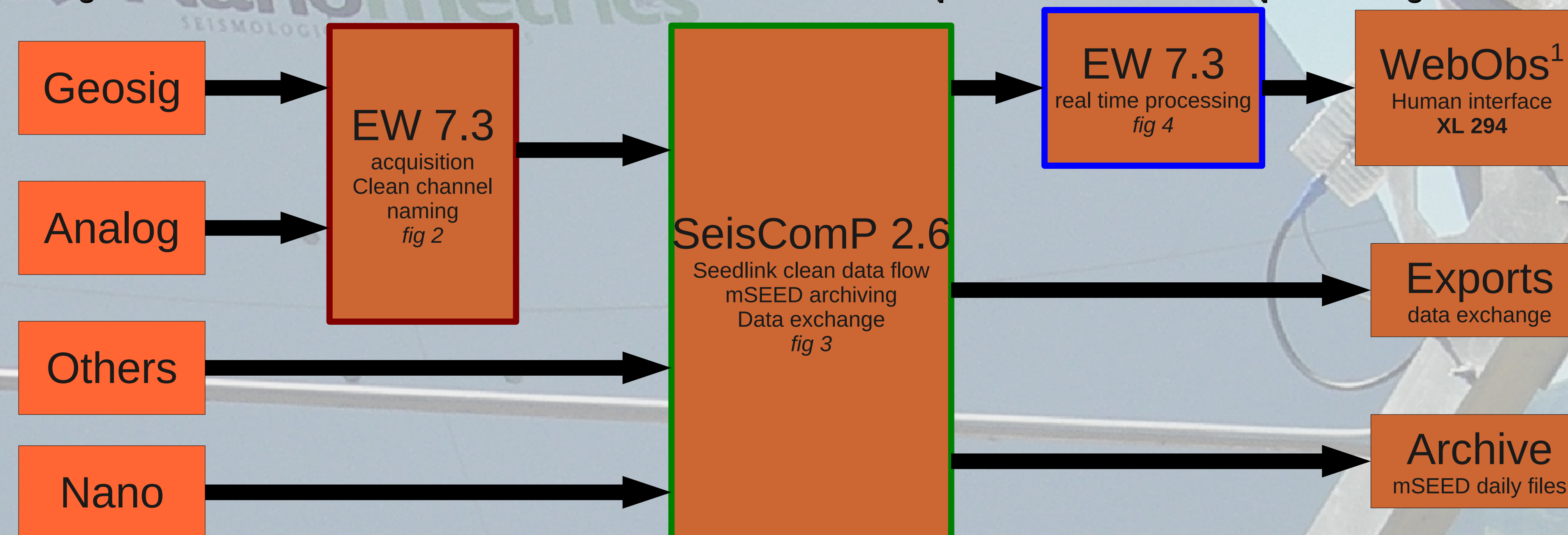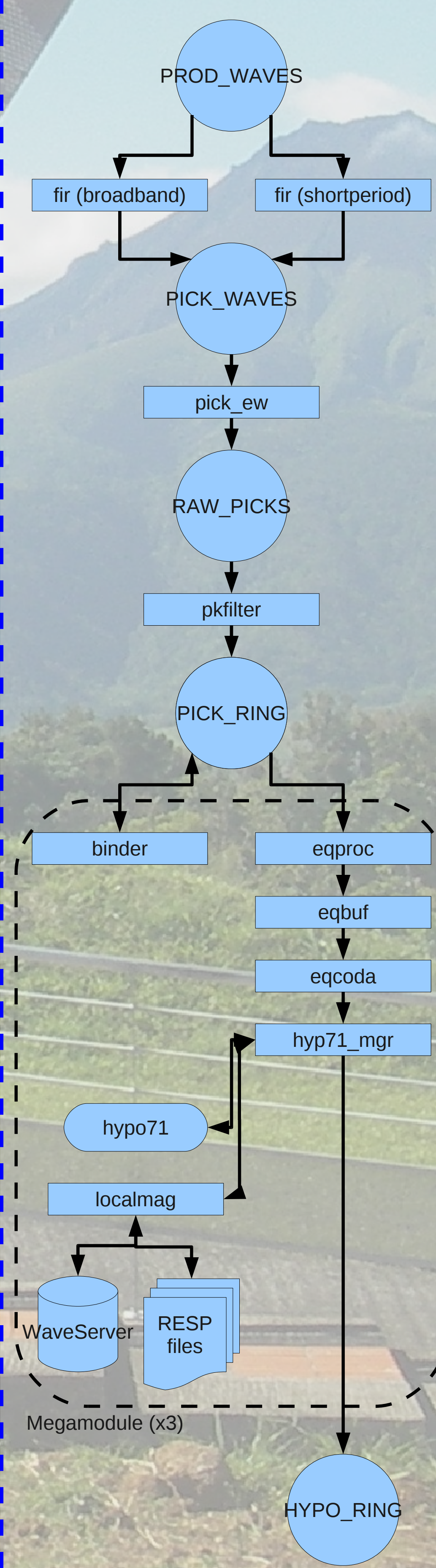


## fig 2. EarthWorm v7.3 - Acquisition



The acquisition EarthWorm takes several 'dirty' data flows, rename them correctly according to SEED v2.4 and outputs everything to SeisComP using an export module.
It's a very simple installation, with a constant computer load, thus allowing a high reliability
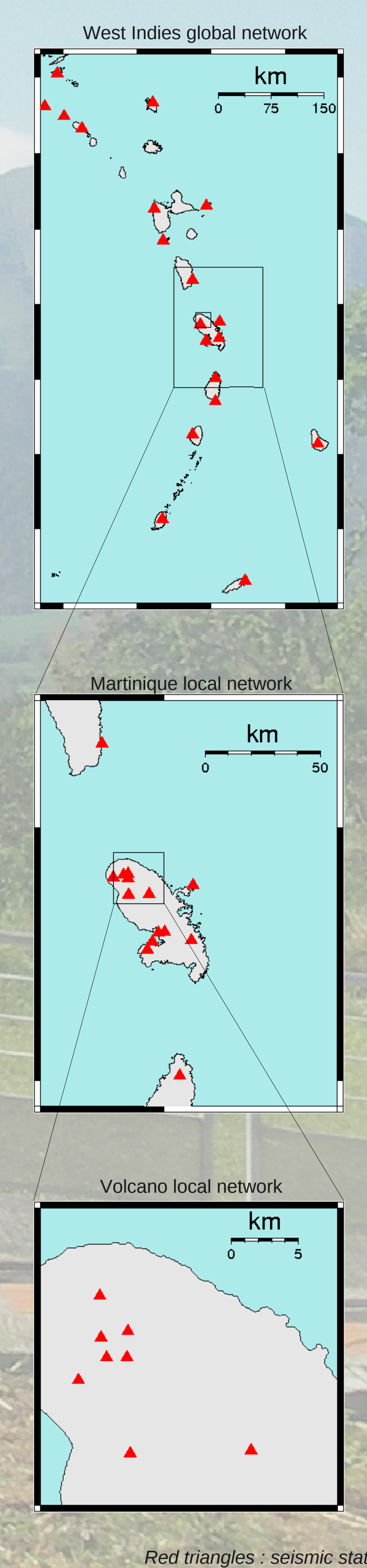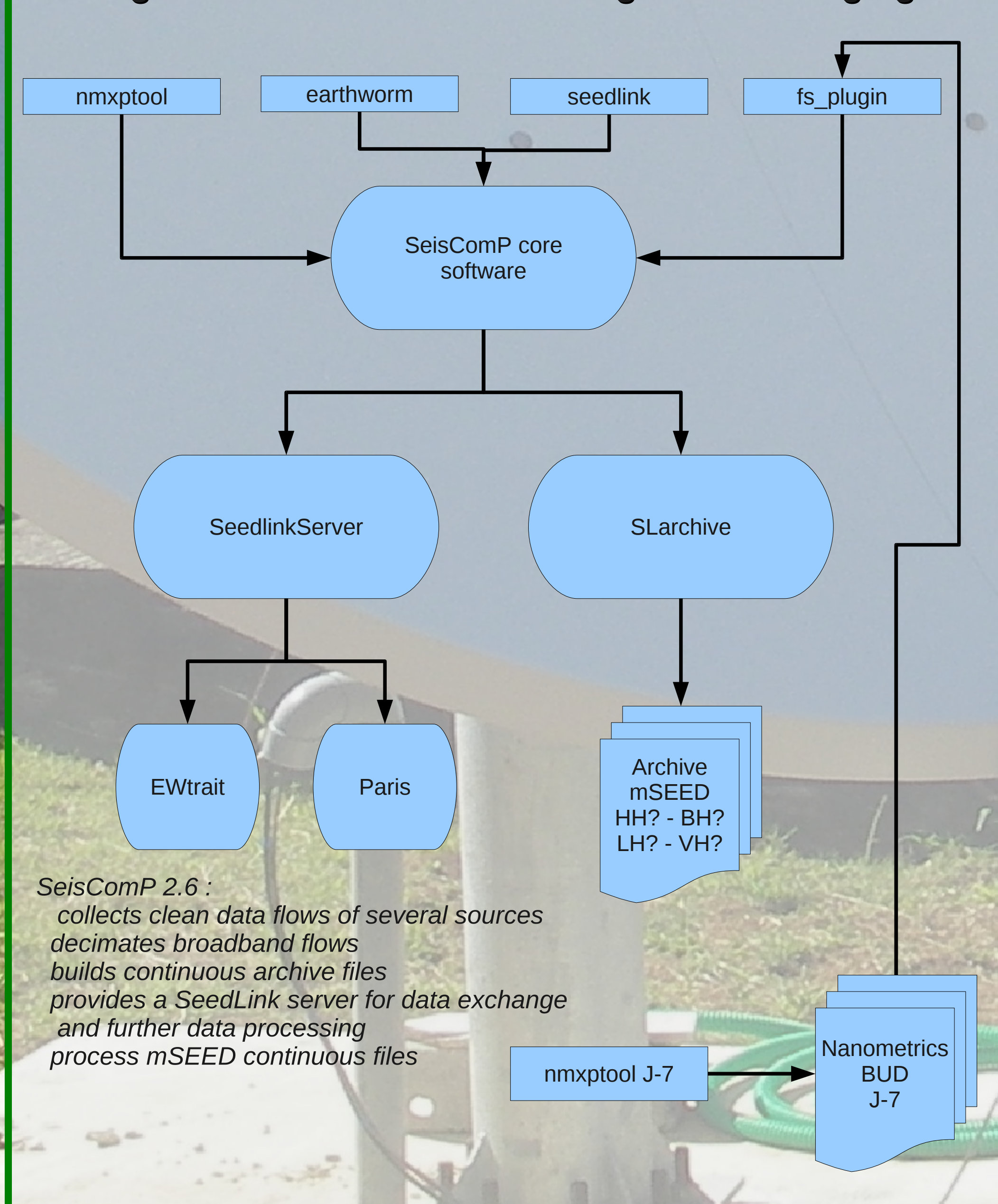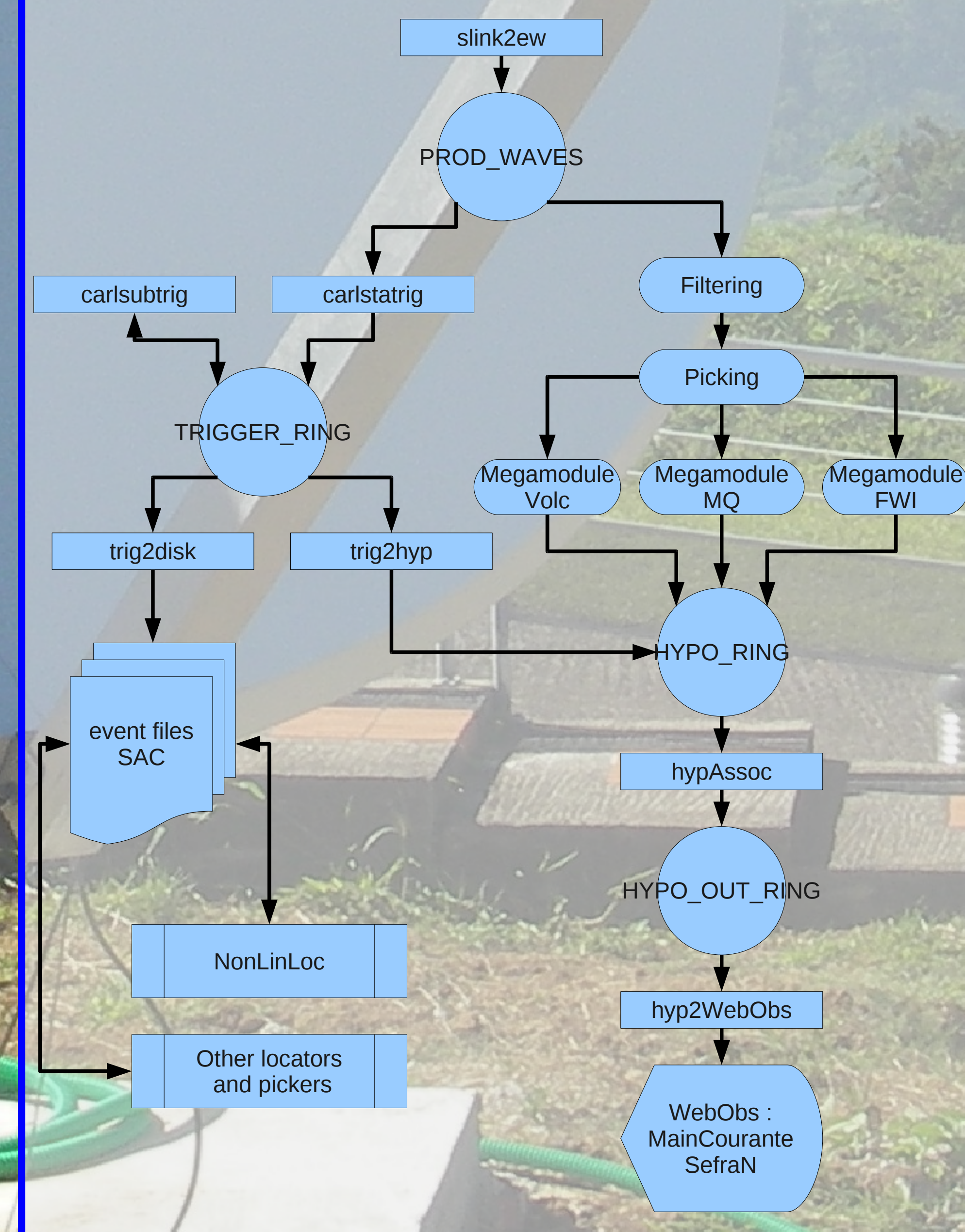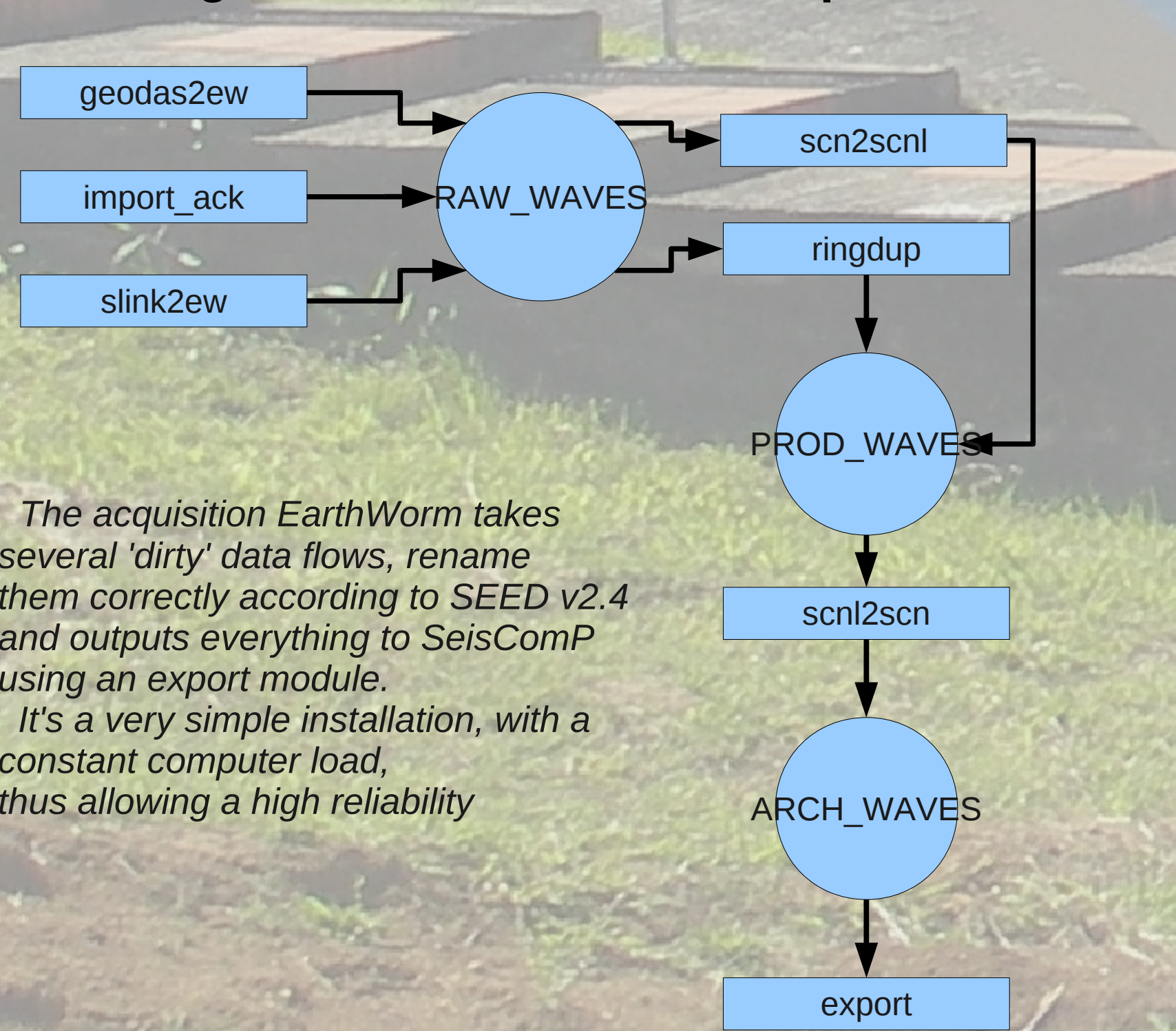
## fig 3. SeisComP 2.6 – Archiving and exchanging



SeisComP 2.6 :
 collects clean data flows of several sources
decimates broadband flows
builds continuous archive files
provides a SeedLink server for data exchange
 and further data processing
process mSEED continuous files

## fig 4. EarthWorm v7.3 – RealTime Processing



## fig 4a. EarthWorm v7.3 Autolocation details



## fig 4b. EarthWorm v7.3 Subnetworks details



West Indies global network

Martinique local network

Volcano local network

Red triangles : seismic station

1- Beauducel, F., C. Anténor-Habazac, and D. Mallarino, 2004. WEBOVS: Integrated monitoring system interface for volcano observatories.
Paper presented at IAVCEI General Assembly, Chile, Nov 2004, abstract S08A_PF_072
EarthWorm : http://www.isti2.com/ew/
SeisComP : http://geofon.gfz-potsdam.de/geofon/seiscomp/
Nmxptool : http://mednet.rm.ingv.it/nmxptool.php