Recent Seismological Products and Services developed within EPOS-Seismology

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EPOS-Seismology is built upon the rich history of coordination projects and infrastructures in seismology and Europe. The services offered by EPOS Seismology are consequently grouped along the three 'pillars' waveform services, seismological products, and hazard and risk. EMSC proposes new seismological products to give access to information related to earthquake parameters (location, time, magnitude, type) and other data and products either derived from seismic waveform recording and modeling, like moment tensors, source models or from earthquake observations like eyewitness reports.

European-Mediterranean Seismological Centre (EMSC) was established in 1975 to provide aggregated and authoritative parametric earthquake information (location, magnitude, moment-tensor, damage assessment) for the European-Mediterranean region and serves as European coordination platform. 85 seismological agencies from 56 countries contribute data to EMSC, which is governed by a Coordination Bureau and an Executive Council.

Collect seismic information (*origin parameters, phase arrivals, moment tensors, …*) from international, regional and national data centers.

Citizen as primary source of information. Internet traffic of EMSC web sites transcripted as earthquake detectors. Gather earthquake responses from eyewitnesses (*comments, felt intensities, pictures, …*).
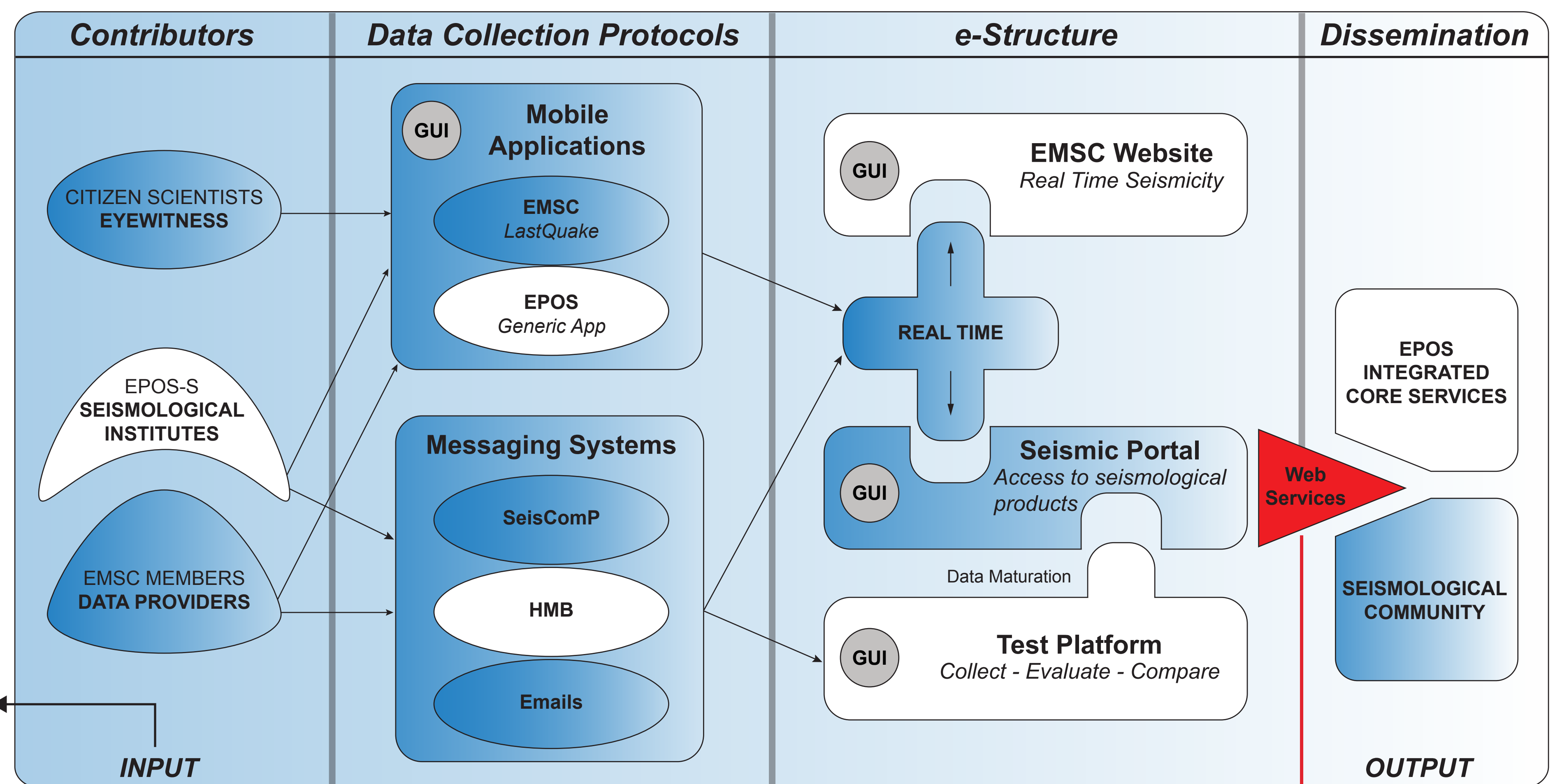

FIG 1 - *Integration of the EPOS developments to the backbone of EMSC's data pipeline.*

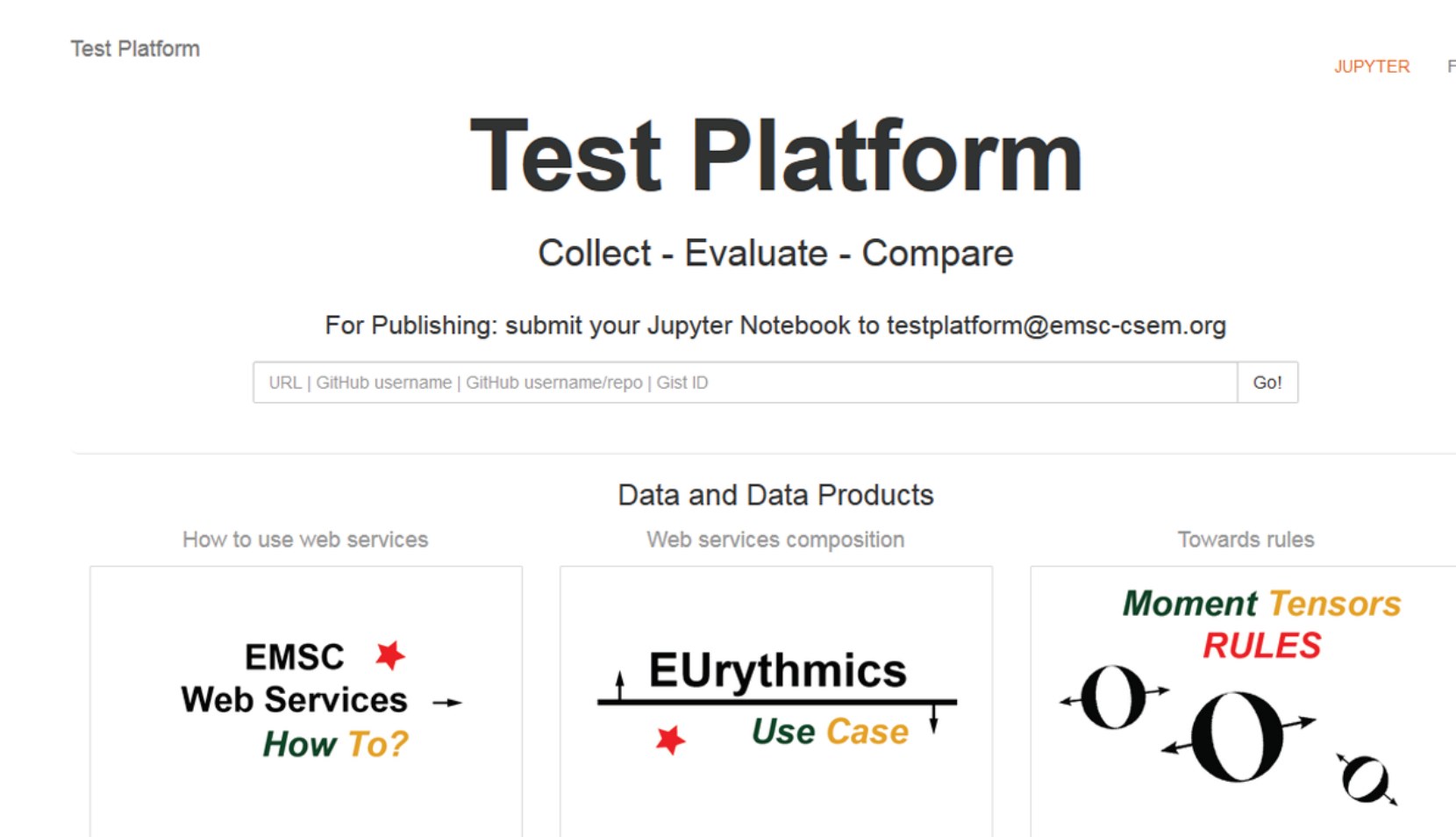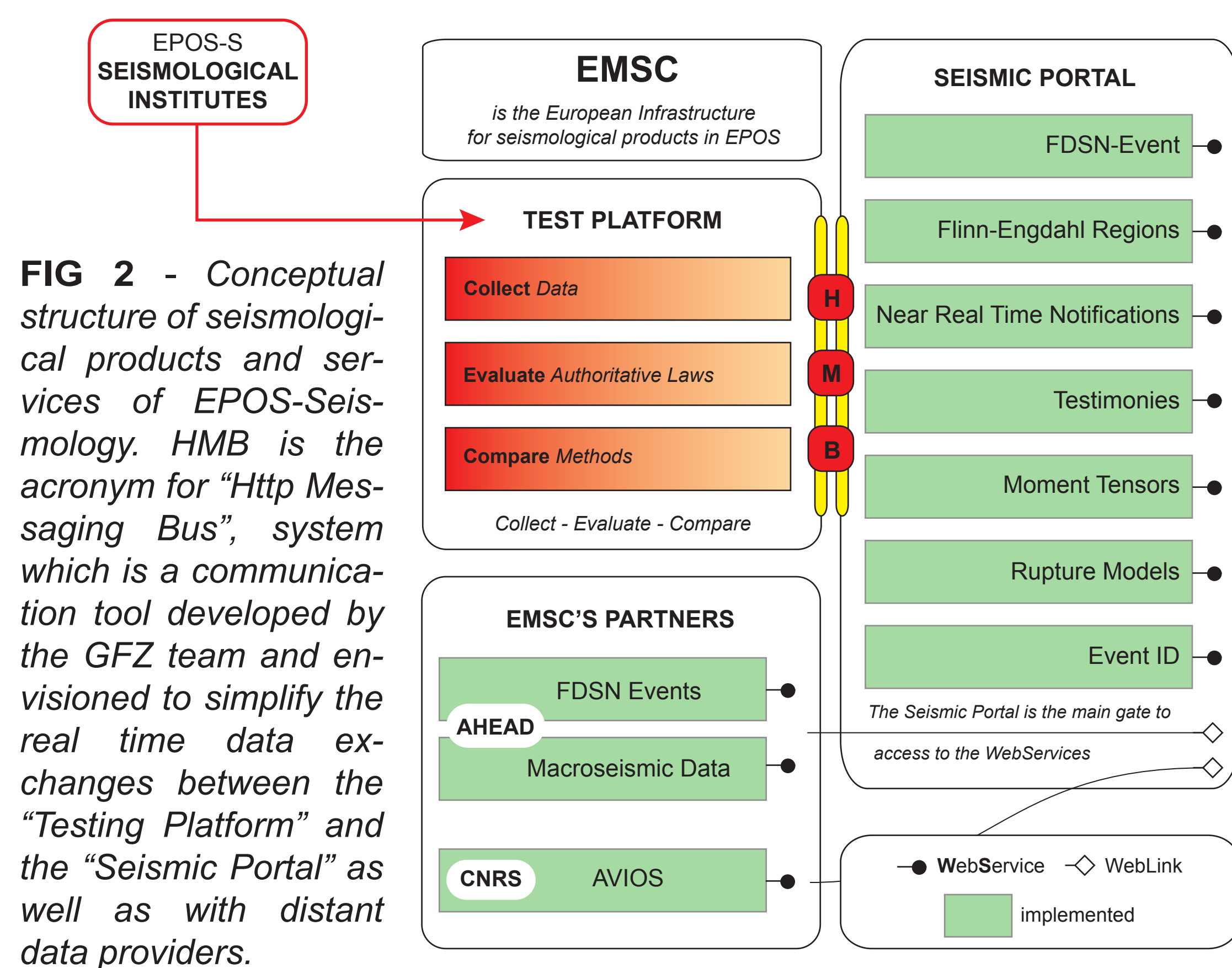## 1 - Seismological Products Pillar of EPOS-Seismology



FIG 2 - *Conceptual structure of seismological products and services of EPOS-Seismology. HMB is the acronym for "Http Messaging Bus", system which is a communication tool developed by the GFZ team and envisioned to simplify the real time data exchanges between the "Testing Platform" and the "Seismic Portal" as well as with distant data providers.*

FIG 3 - *A companion Test Platform has been developed and is accessible at the adress: http://cerf.emsc-csem.org:8080. This platform is part of the perspective of testing new seismological products within the framework of EPOS-Seismology and allows to increase knowledge sharing and to animate the scientific community around collaborative means.*

3 - Hands-on Session

Guidelines for training are also available online:
https://github.com/EMSC-CSEM/Hands-on-Session
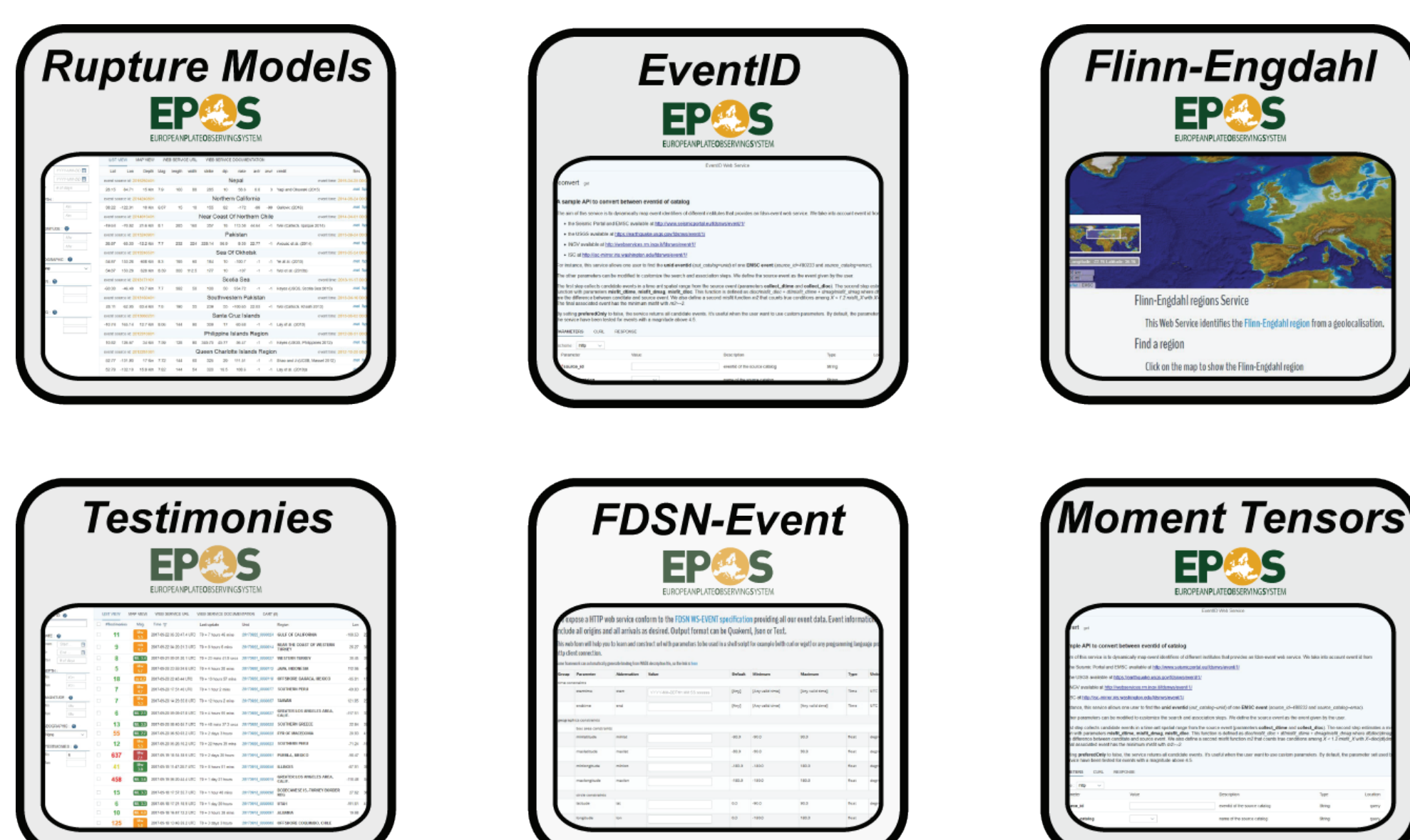
How to use EMSC's Services

FIG 4 - *Each Web Service has its own URL and specification documentation. A service is composed of a Graphical User Interface (GUI) with a Query Builder / Search Engine and a Mapping Tool (when it is suitable). The Hands-on Session will help to compose services that enables applications to communicate remotely over the Internet regardless of the platforms and languages on which they are based.*

2 - Focus on EMSC (Web) Services

FDSN-Event web service is conform to the FDSN standards (*http://www.fdsn.org/webservices/FDSN-WS Specifications-1.1.pdf*) and provides all the EMSC event data available. Event information can include all origins and all arrivals reported to EMSC by its member institutions. The web service is accessible at the address: *http://www.seismicportal.eu/fdsn-wsevent.html*. The homepage of the service allows the user to build their own queries through a Graphical User Interface (GUI).
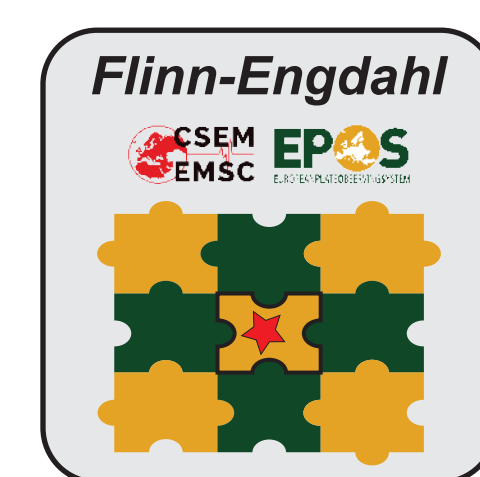
Flinn-Engdahl Lookup web service identifies the Flinn-Engdahl region from a geolocalisation entry point. The web service is accessible at the address: *http://www.seismicportal.eu/feregions.html*.
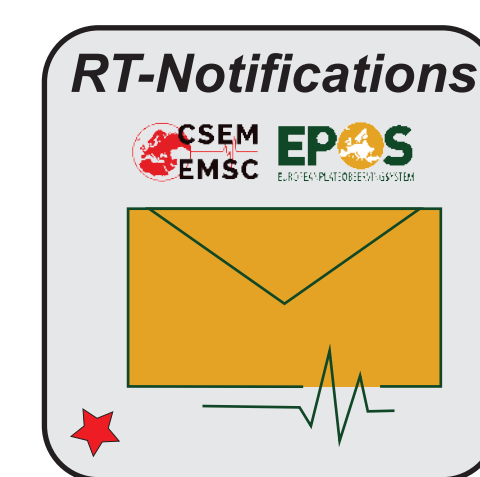
Near Realtime Notification of new and updated earthquake event can be received using the WebSocket protocol. Any WebSocket client can connect to our service to be notified. Javascript, Python example codes are provided to demonstrate the service at the adress: *http://www.seismicportal.eu/realtime.html*.
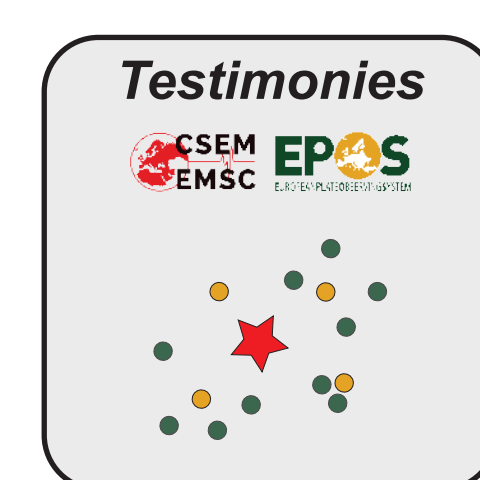
Testimonies web service allows to download all testimonies collected from eyewitness during earthquakes through EMSC websites and Lastquake mobile application. The web service and the specifications document are available online at the following adresses: *http://www.seismicportal.eu/testimonies-ws* and *https://www.emsc-csem.org/Files/epos/specifications/Specs_Testimony-WS.pdf*.
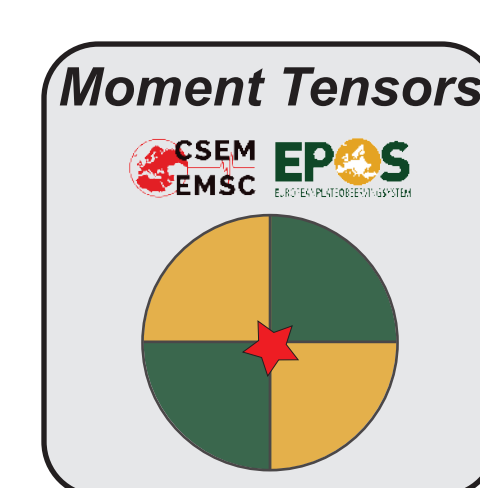
Moment Tensors web service gives access to all the Moment Tensors collected at EMSC. It is accessible through the URL *http://www.seismicportal.eu/mtws* and the specifications document are available at *https://www.emsc-csem.org/Files/epos/specifications/Specs_MT-WS.pdf*. The homepage of the service shows a list of the latest Moment Tensors collected, sorted by event, with a companion graphical 'beach-ball' representation.
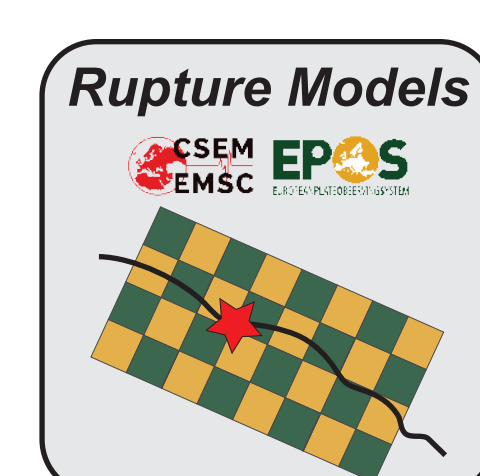
Rupture Models service allows to query the earthquake source models of the SRCMOD database (P.M. Mai, 2012). It is accessible at *http://www.seismicportal.eu/srcmodws* and the specifications document are available at the address: *https://www.emsc-csem.org/Files/epos/specifications/Specs_SRCMOD-WS.pdf*.
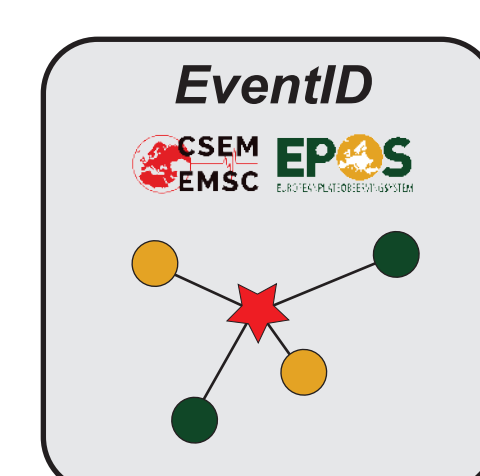
EventID web service dynamically maps event identifiers to allow the identification of a same event between different seismological institutions. The web service is accessible at the address: *http://www.seismicportal.eu/eventid* and the specifications document are accessible at the address: *https://www.emsc-csem.org/Files/epos/specifications/Specs_EventID-WS.pdf*.

The Seismic Portal: *www.seismicportal.eu/webservices.html*
is the main interactive gateway to access these services.

4 - Acknowledgement