

Specifications of the EMSC testimony's Service

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I. Aim of the document

The aim of this document is to describe the specifications of all functionalities the EMSC will develop in order to give access to intensities of individual testimonies of seismic events collected by the EMSC. This includes the interactive access through the Seismic Portal website and the web service integrated into the EPOS Thematic Core Service.

The second section describes the data we receive at the EMSC and the parameters chosen to characterize testimony data.

The third section gives specifications of the new functionalities of the Seismic Portal allowing users to access the intensities of testimonies through a web service and an interactive web search.

Note about “testimony data” and “macroseismic information”

In this document, testimony data refers to the intensities collected as felt reports with the web and mobile site and with the Lastquake application. These data may be used to infer macroseismic information of seismic events. However, since they don't contain vulnerability information of infrastructures, the intensities of testimonies provided by this service can't be labeled as “macroseismic”.

The Seismic Portal

The Seismic Portal has been developed within the NERIES FP7 project. This web site is operational and is a single point of access to explore and download earthquake information. It's available at the url www.seismicportal.eu. Future development of EPOS services will be integrated into the Seismic Portal.

II. Description of testimony intensity collected by eyewitnesses







This section describes the overview of the EMSC system that collects testimonies of felt earthquakes, it describes the restriction on the provided data ("this is not a real-time service") and the parameters that define testimonies.

1. The collect of testimonies

One of the main activities at the EMSC is the collection of testimonies from earthquake eyewitnesses. Bossu et al. 2016¹ gives a complete description of this collection system. In July 2014, the EMSC launched a new smartphone application named LastQuake (Android and iOS platforms) that replaces the traditional online questionnaire with a thumbnail-based questionnaire (Bossu, et al., 2015a). This change was implemented simultaneously on its dedicated website for mobile devices –hereafter named mobile website- (m.emsc.eu last accessed May 2016).

The new questionnaire is based on 12 thumbnail-sized images conceptualized by a professional cartoonist that aim to be culturally neutral and to depict each level of the EMS-98 macroseismic scale (see Table 1). Each testimony has an individual geographical location, when the user has accepted to share it, it is the location provided by the mobile device (for testimonies collected from the app and the mobile website), otherwise the user is invited to provide his/her postal address which is then converted to a point location through an online service. Testimonies are collected from all the continents, with the majority of them coming from Europe, Continental Asia and North America.

Table 1: Subset of the thumbnails used to collect felt intensity

<p>Not Felt</p> 	<p>Intensity 3</p> 	<p>Intensity 5</p> 
<p>Intensity 7</p> 	<p>Intensity 9</p> 	<p>Intensity 11</p> 

¹ Thumbnail-Based Questionnaires for the Rapid and Efficient Collection of Macroseismic Data from Global Earthquakes, Rémy Bossu, Matthieu Landès, Frédéric Roussel, Robert Steed, Gilles Mazet-Roux, Stacey S. Martin, and Susan Hough. *Seismological Research Letter*. Oct 2016. doi: 10.1785/0220160120

1. Data quality

This collection system developed at the EMSC associates testimonies to seismic events. This association is mainly done automatically by the user. The process is automatic and is not revised by seismologist. So it's possible that some testimonies are associated to wrong event and create testimonies at unrealistic combination of Intensity and Epicentral distance (for a given magnitude).

2. Raw and corrected intensities

This service proposes two intensities for each testimony, the raw and a corrected intensity.

- The **raw intensity** is the value directly collected by our system. All values are kept as is with no filtering, no clipping and no correction.
- **Corrected intensities** are calculated from raw intensities with the correction defined in Bossu et al. 2016¹. As described in the article, some testimonies with a raw intensity larger than 10 are not included.

3. Data access restriction

a. It's not a real time service!

When an earthquake occurs, we collect testimonies in real time and this service is built to give access to this data. However this testimony service is not intended to be updated in real time. After a significant event, the data will be available after a delay not yet defined.

b. Authentication procedure

Moreover, we plan to implement an authentication procedure in a second step of the development. The solution is not yet defined. It could be online registration, subscription by mails, IP adresse filtering. This choice is purely technical and is intended to avoid an overload of our servers when users download large volume of data in an uncontrolled way. This will help us to identify the user, contact him and find an alternate solution.

4. Parameters describing intensities of testimonies

To describe intensities collected, we associate testimonies with the corresponding earthquake through the UNID parameter.

Event information			
UNID			UNified ID used at the EMSC to identify events

The following parameters describe all intensities collected for one felt earthquake. Note that these data contain an array of location and intensities for each individual testimony.

intensity data point information			
nvalues		integer	Number of points
array data		Array	Array of nvalues points
longitude	degree	float	Point longitude
latitude	degree	float	Point latitude
intensity	[1..12]	float	Raw intensity of one point
corrected intensity	[1..12]	float or 'nan'	Corrected intensity of one point
lastUpdate	UTC	datetime	date and time of the last update of the data
thumbnailInfo		string	version of the thumbnails
correctionInfo		string	description of the correction

Remark on the value of the corrected intensity: if the value of the raw intensity is larger than 10, then we discard this testimony and we don't provide a corrected intensity.

III. Interactive access and Intensity data point service

The different ways to access testimony data will be developed as extensions of the existing Seismic Portal with an interactive access and a web service. Three new functionalities are identified:

1. Update of the event page (called the “eventdetails” page) of the Seismic Portal to display testimony’s information of EMSC events;
2. Give access to data available at the EMSC via a web service;
3. Add an interactive query search on the Seismic Portal for the associated web service.

1. Testimony’s information on the event page of the Seismic Portal

The idea is to add testimony information for felt earthquake into the “eventdetails” page of the Seismic Portal. This functionality is a new section like the existing “origins” and “arrivals” sections and like other new data developed within EPOS (e.g. Moment tensors). This section will be called “Testimony”.

This section will display the following information:

- The number of testimonies collected for this event;
- A table of location (longitude, latitude) and raw and corrected intensities for all testimonies;
- The date and time of the last update;
- The version of the thumbnails.

Moreover, the user should have the possibility to download these information using the output format described in the web service.

2. Testimonies web service

This service is a part of the EPOS Thematic Core Service. It aims to give access to the intensities of felts reports collected at the EMSC via a web service that is integrated into the Seismic Portal. This service is independent of existing EMSC web services and the specifications follows as closely those of FDSN-event.

As for the FDSN-event, this service gathers data for a given request, which can be based on:

- a search by region, or
- a search by time period, or
- a search for a specific event defined by an ID.

The user may choose to add other filtering rules on the magnitude of seismic events and on the number of reports associated events.

The output of the available data for a given request may be a zip archive of csv files (see Annex IV). The option of a quakeML format will be implemented with the incoming quakeML 2.0 version that includes the description of macroseismic data.

Specifications of this service are very similar to the FDSN-event specifications. The description of all available parameters is listed below in the Table 2 (page 9). The specification column refers to:

- FDSN indicates that the parameter behaves the same way as for FDSN-event specification;
- 1 - “from starttime” time constraint allows querying all focal mechanisms with the event time between “starttime” and “dayafter” days.
- 2 – The specification of the zip format is described in the Annex IV. The quakeml format will be implemented when the version 2.0 will be available. This version should allow the description of macroseismic data.
- 3 – Constrains minvalues and maxvalues allow to select events according to their number of reports.

3. Interactive search

Like other web services, the interactive search is a web interface that should give the user the possibility to request testimony data with all filtering options defined in the web service specifications.

Table 2: Description of parameters used in the web service

parameter	abbreviation	min	max	type	Units	Specification
time constraints						
date range						
starttime	start			time	UTC	FDSN
endtime	end			time	UTC	FDSN
from starttime						
starttime	start			time	UTC	1
dayafter		1			integer	1
geographic constraints						
area-rectangle						
minlatitude	minlat			float	degrees	FDSN
maxlatitude	maxlat			float	degrees	FDSN
minlongitude	minlon			float	degrees	FDSN
maxlongitude	maxlon			float	degrees	FDSN
area-circle						
latitude	lat			float	degrees	FDSN
longitude	lon			float	degrees	FDSN
minradius		0	180	float	degrees	FDSN
maxradius		0	180	float	degrees	FDSN
specific event						
eventid				string		FDSN
output control						
format		json, zip, (quakeml)		string		2
nodata				string		FDSN
filtering constraints						
minvalues				integer		3
maxvalues				integer		3
minmagnitude	minmag			float		FDSN
maxmagnitude	maxmag			float		FDSN

IV. Annex: description of the zip format

The zip format is a single ZIP file that contains one csv file per requested events.

Each csv file is divided in two parts:

1. A header of 4 commented lines containing the unid of the event, the thumbnail version, the description of the applied correction and the parameter of each column;
2. the csv data of 4 columns formed by the longitude, latitude, the raw intensity and the corrected intensity.