QUAKEML DATA MODELS FOR PEAK GROUND MOTION, STATION CHARACTERIZATION, AND SITE CHARACTERIZATION

Philipp KÄSTLI[1], Fabian EUCHNER[2], NERA NA3 community, Swiss Seismological Service- Seismic Network and Engineering Seismology groups

Within the last years, several thematical extension schemas for the QuakeML data model have been drafted. These include models for earthquake faults, macroseismic information, management of seismic instruments, and hydraulic parameters of borehole injection processes. In this contribution we describe three of them which are based on requirements from multiple stakeholders, thus have received considerable peer review, and for which at least one productive application has been implemented. Meanwhile, they can be considered mature enough for a public Request for Comments (RfC) process.

a) Peak ground motion

This schema defines *StrongOriginDescription* as a complementary extension of the QuakeML Basic Event Description concept *Origin*. Strong origin descriptions link *StrongMotionRecords*, i.e., descriptions of processed waveforms, along with sampling, filtering and gain information, and optional waveform file reference. An unlimited number of peak motion descriptors (spectral and non-spectral acceleration, velocity, displacement, instrumental intensity etc.), along with their uncertainties and calculation methods, are implemented as child elements of a waveform description.

Requirements for the QuakeML Peak Ground Motion package were derived in a RfC process among NERA NA3 project partners. The *scwfparam* waveform parametrization package of SeisComP3, which is the core of the NERA Rapid Raw Strong Motion database, is implemented using a draft database and XML implementation of this data model.

b) Station Characterization

The Station Characterization schema features an extension of the *Network-Station-SensorLocation* description of the GFZ InventoryXML schema, covering management information (affiliation, owner & site manager contacts), and descriptions of the geological, geotechnical and built environment of seismic stations. Authoritative results of standard geophysical site characterization methods are referenced from the Site Characterization Schema.

Requirements for this data model are compiled from feature requests for the NERA NA3 station book, as well as from the station evaluation carried out within the project for a renewal of the Swiss Strong Motion (SSM) network. Widely identical implementations in SQL are developed by ORFEUS (for the NERA station book) and SED (for the documentation of the Swiss Seismic Network).

[1]Swiss Seismological Service, Federal Institute of Technology, Zurich, Switzerland, kaestli@sed.ethz.ch
[2]Institute of Geophysics, Federal Institute of Technology, Zurich, Switzerland, fabian@sed.ethz.ch

c) Site Characterization

The main purpose of the Site Characterizaton schema is to document field measurement campaigns for different site characterization methods (noise arrays, H/V, active seismics, borehole logging, SPT, etc.) along with their raw data (instrument deployments, collected waveforms), analysis methods, and results. Results currently cover classical travel time analysis, velocity profiles, H/V curves and identified peaks, amplification functions, dispersion curve ellipticity, quarter wavelength representation, SPT and drilling logs.

The schema was first developed for streamlining the data management of multiple site characterization projects carried out at SED, and proved useful to cover also NERA needs for geophysical characterization of seismic station sites. It is implemented and operative in SQL, along with a Java codebase implementation for data management.

As of now, all three packages are subjected to a public Request for Comments process, in order to finally be standardized as QuakeML 2.0 data model packages.