

Conversion of SEED format to XML representation for a new standard of seismic waveform exchange

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The Standard for the Exchange of Earthquake Data (SEED) has been designed as an international standard format for the exchange of digital seismological data. It is now widely used among the community which maintains the broadband seismograph network and recognized as a standard format for data exchange. SEED volume consists of headers and data records and blockettes are stored in headers. The format for data records is called mini-SEED and it is closely related to the format recorded in data loggers. Since SEED blockettes are defined as a collection of named fields with fixed length data, this introduces difficulties of extension of data structures. However, because there already exist huge amount of waveform data saved in mini-SEED format, it is a formidable task to fully revise the current SEED format to allow future flexible extensions. Although it has been recognized that the revision of SEED format is necessary, there has been no attempt for revision since its latest release of Ver. 2.3 in February, 1993 because of this difficulty.

Here, we represent SEED header structure in XML (eXtensible Markup Language) and show that this representation allows extension of header content without introducing any modification to existed mini-SEED waveform data structure. To represent SEED header structure in XML, we have paid attention to (1) entities described in the current SEED headers should be identical to those described in XML representation; (2) changes in structures of SEED headers should be as small as possible; (3) XML document should have structures that allow validation with XML-Schema language. The first requirement is essential to keep compatibility with XML-based SEED description with the current SEED volumes. The second one is to avoid complexity of conversion. The third one is for more robust data validation. Although we do not modify the current structure of mini-SEED formatted waveform data in our XML-based full-SEED format, our representation of SEED header in XML may allow a distribution of waveform data through header only XML-based SEED volume. Then, to get seismic wave data, one can access data server or look for data files according to data location described in this header file.

We plan to distribute seismic waveforms recorded by broadband seismograph network of Ocean Hemisphere Project through Pacific Region Geophysical Network Data Center of IFREE in our prototype XML representation of SEED format. We also plan to distribute software to read our prototype XML-based SEED volume for users to review our XML representation of SEED format.