Introduction

This document summarizes the Technical Review findings of the miniSEED 3 seismic data format proposal. This proposal is a specification representing a significant update to the current FDSN miniSEED 2.4 format for the exchange of geophysical time series data. In March of 2022, the miniSEED 3 proposal reached the "Evaluation and Adoption" phase of the [FDSN process](#) for feature adoption with working groups. Following an opportunity for the community to raise discussion on any technical aspects of the implementation and documentation, an Evaluation Review Team was formed to produce this report based on the associated documentation and any experience gained through implementation.

It is important to note that the notion of introducing a next generation data format was first put to the community back in 2016, and by 2018 a set of requirements was finalized and released. Over this course of time a significant amount of community feedback was provided and reflected in the proposal being evaluated.

Significant features

The miniSEED 3 technical proposal introduces several significant changes to the existing specification, including:
- The incorporation of FDSN-approved [Source Identifiers](#) to significantly expand the namespace of unique data sources that can be referenced
- Variable length records that can be up to 4 GB in size
- Rationalization of content in the existing miniSEED 2.4 record header to recognize prominent data items that merit being present in header
- Expanded sample rate/period to a 64-bit floating point value
- Fixed, explicit little-endian byte order for binary content in the record header
- Replaced the blockette scheme with a flexible JSON-based expandable hierarchical header structure

Technical Considerations

Areas that merited particular technical consideration when evaluating the proposal were:
- backward compatibility with the existing miniSEED 2.4 data format
- header size efficiency

Compatibility

It is important that the data format be suitably backwards compatible. The miniSEED 3 design proposed accommodates almost all of the information currently present in existing miniSEED records, with the exception of:
- records that reference more than one clock model specification
- blockette 400 (Beam)
- blockette 405 (Beam Delay)
- blockette 2000 (Opaque Data)

Furthermore, in conjunction with the proposal there are conversion tools available to validate miniSEED 3 formatted files as well as easily adapt existing records to the new format.

Header Size

The proposed data format provides a much higher level of flexibility and scalability compared to its predecessor; however it should be noted that there is a tradeoff between these benefits and the size of the record. A higher level of flexibility requires a larger header size which in turn has an impact on transmission and storage costs. On an individual basis the design choice made for each field in the record header is compelling, nevertheless in the aggregate the storage requirements for these accumulate. The effects of this are of course a function of the number of record headers in an archive so there is a means available, the size of the records, to help manage this.

Recommendation

The Technical Evaluation Team has reviewed the miniSEED documentation as submitted, as well as the background context associated with many of the issues raised by the community during the development of the proposal. The team believes that the new format is technically sound and, if accepted, will represent a significant step forward in the evolution of this fundamental data format used by the community.

The team recommends approval of the proposal from a technical perspective.

Thank you,

Jarek Bienkowski
Robert Casey
Philip Crotwell
David Easton
Philip Hill
Roman Racine