BDS Metadata/API Changes 2021-05-18

1. Introduction

This lists the proposed changes to the BDS API and Database schema for the new Events system as well as improving Response Metadata storage and other items. The BDS API change will mean both the bdsServer and clients will need to be updated in order to communicate.

Some of the changes relate to the newish StationXml as well as the SEED format in order to store and export more fuller Metadata that is currently not supported in the BDS system.

2. Locations

Both StationXml and SEED supports the concept of individual Channel lat/long locations as well as Station locations. We propose to add per Channel location ability to the system to fully support this. This would be done by adding a “String channel” field to the Location object. If this field is null, the default, the location is for a Station as it is now. If the Channel field is set however, this would be a per Channel location.

When importing Metadata the Channel locations would be set, if they are different from the Station locations.

On Exporting the Channel locations would be used, if present, for the Metadata’s Channel locations in the StationXml and SEED formats. For formats that don’t have separate Station/Channel locations the Channel locations would be used if present.

The BdsGui programs would have a separate list of Locations when editing a Channel for these Channel locations.

3. Calibration WaterLevel

StationXml has a WaterLevel parameter. We could store this in the Calibration object which also has depth.

4. Calibration RawData Units

Seismic raw data can be in “m”, “m/s” or “m/s**2” dependent on the Sensor type. However the Calibration defined units may not match these as the Response filter compensation stages might perform the transformation from say “m/s**2” to “m” when applied.

It would be useful to know the Units and Calibration factor for the raw data so that simple plots and maybe simple and quick data analysis can be done reliably on the raw data without having to apply the Response compensation.

I suggest we can handle this by having optional extra fields in the Calibration object for the raw data with the names “rawCalibrationFactor”, “rawCalibrationUnits” and “rawCalibrationFrequency”. We can then optionally set these these on a Channel by Channel basis

either automatically (a program performs analysis of the Response stages and generates the appropriate parameters) or manually.

The BDS utilities, such as the BdsGui and BdsWeb graph plotters would use this raw data calibration values if present to scale and provide the units on the graphs. If these are not present the graph units will be “counts” and the scaling as per calibrationFactor leading to misleading scaling for some channels.

5. Responses

1. Add the Input and Output SI units as used by both StationXml and SEED. If these are unset, then StationXml/SEED Metadata exports will set these to reasonable values so the produced files pass tests.
2. Add the Decimation/Offset, Decimation/Delay, Decimation/Correction parameters.

6. Event API

The Event API will be added as previously discussed.

7. Channel types

The BDS currently defines channel data types as: “seismic, seismicUnknown, data, log, unknown, empty”. Looking at the SEED channel naming convention, mainly the second letter of the channel name, I suggest we add/change these to:

DataType	SEED ICode	Description
seismic	H, L, G, M, N	
seismicUnknown		
data	Y	Generic data no specific type
log		
unknown		
tilt	A	
creep	B	
calibration	C	
pressure	D	
testpoint	E	
magnetometer	F	
humidity	I	
rotation	J	
temperature	K	
waterCurrent	O	
geophone	P	

voltage	Q	
rainfall	R	
linearStrain	S	
tide	T	
bolometer	U	
volumetricStrain	V	
wind	W	
generated	X	
beam	Z	

8. Old ASCII Response Formats

Still need to look at handling the IDC and SAC old ASCII response formats better.

9. Issues

9.1. Response stage with no frequency response

I have seen a channels Metadata in SEED format for DG:0385F:CHE_01 where there is a response stage that has a gain/gainFrequency but no PoleZero, FIR or FAP frequency response. Not sure if this will be an issue on export for other programs.

10. Others

- Response object should be based on BObj.
- Add getMetadataFormatted() API call. Currently you have to ask for the metadata based on Sensor data present in the BDS.
- BdsServer configuration get API call.
- User preferences API call.
- Implement SpecialChannels database API to handle a list of channels that should be ignored on import. This is currently handled by the bdsSpecialChannels() API call that returns a hard coded list.
- Responses add input and output SI units.
- Add support for Channel locations different from Station Locations.

11. Metadata Not Currently Stored

This lists the core items of SEED and StationXml that are not currently stored within the BDS.

Name	Type	Description
52/Max clock drift	SEED	
52/Number of comments	SEED	

52/Channel flags	SEED	
53/AO normalization factor	SEED	The BDS calculates these on export
53/Normalization frequency	SEED	The BDS uses the calibrationFrequency for this on export
53/poles and zeros errors	SEED	
55/amplitude error	SEED	
55/phase error	SEED	
57/Decimation offset	SEED	
57/Estimated delay	SEED	
57/Correction applied	SEED	
41 FIR Dictionary	SEED	Not seen
42 Response Polynomial Dictionary	SEED	Not seen
43 Response Poles+Zeros Dictionary	SEED	Not seen
45 Response Coefficients Dictionary	SEED	Not seen
46 Response Generic Dictionary	SEED	Not seen
47 Decimation Dictionary	SEED	Not seen
48 Sensitivity Dictionary	SEED	Not seen
49 Response Polynomial Dictionary	SEED	Not seen
43 Response List Dictionary	SEED	Not seen
59 Channel Comments	SEED	
62 Response Polynomial	SEED	
Station/restrictedStatus	StationXml	
Station/Comment	StationXml	
Station/Site	StationXml	
Station/WaterLevel	StationXml	Can add this as above
Station/Vault	StationXml	
Station/Geology	StationXml	
Station/Equipment	StationXml	We have most of this in the Sensor and Digitiser but some info is missing.
Station/Operator	StationXml	
Station/ExternalReference	StationXml	
Channel/WaterLevel	StationXml	Can add this as above
Channel/type	StationXml	We have dataType but this does not directly match this
Channel/ClockDrift	StationXml	
Channel/Sensor	StationXml	We have most of this but not all

Channel/Preamplifier	StationXml	
Channel/Datalogger	StationXml	We have most of this but not all
Channel/Equipment	StationXml	
Response frequency ranges	StationXml	In general we don’t have information on frequency ranges and variations within these ranges
Response/InstrumentPolynomial	StationXml	
Response/Stage/Coefficients errors	StationXml	We have just an error value not plus and minus error values.
Response/Stage/ResponseList errors	StationXml	We have just an error value not plus and minus error values.
Response/Stage/FIR	StationXml	Not seen
Response/Stage/Decimation/Offset	StationXml	
Response/Stage/Decimation/Delay	StationXml	
Response/Stage/Decimation/Correction	StationXml	
Response/Stage/Polynomial	StationXml	