Nanometrics Protocol (NP) Seismic Data Packet Format and Processing

1 About this document

This document contains selected information about Nanometrics Protocol (NP) packet format and processing. The information is targeted to assist customers in writing a utility to convert streaming Nanometrics NP seismic data packets to WIN streaming format.

Please note that the information provided applies to seismic data streamed from Taurus running firmware version 2.*x* and that it may change for subsequent Taurus firmware versions. Confirm that the document is relevant to the version of Taurus firmware you are using. Updated documents will be made available as required up until Taurus firmware supports streaming seismic data in WIN format.

Contents

2 Conventions and terminology

All numeric values are unsigned integers and big-endian ordered (most significant byte first, like Java and Motorola byte order) unless stated otherwise.

- Bytes are 8 bits.
- Bytes are packed without any hidden bytes inserted for alignment.
- A "packet" refers to a single NP packet.
- Each time-series packet will contain one data "payload".
- A "band" refers to a data channel.

3 Overview of NP packet format

Each NP data packet contains the following information:

- A BandId: identifies the stream of NP packets by datasource and band name
- Sequence Number: packet sequence within the scope of the packet's BandId
- Metadata Sequence Number: identifies associated metadata packets
- Time: the time the data in the packet was generated, in nanoseconds since 1970 epoch

- ◆ Geographic Location
- ◆ Data payload

Taurus embeds NP packets in UDP packets for transmission via IP.

4 Seismic data packets

A seismic data packet is sent when full or when a significant event occurs (time change, configuration change, going to reboot) that causes it to be flushed immediately.

Values in this section, for example an Offset field or a specific value in a field Description, are applicable to seismic data packets as created on Taurus.

4.1 Packet header

There is a single main header block for each packet.

Table 4-1 Packet header format

Offset	Field	Data type	Description
0	NpVersion	2 byte integer	ASCII characters 'N' & 'P' `0x4E50`
2	PacketSize	2 byte unsigned integer	The total size of the packet; either 499 or 243 for seismic data packets, for 7 or 3 data frames respectively
4	SequenceNumber	4 byte integer	The sequence number of this packet in the specified band. The sequence number starts at 0 and increments with every packet.
8	MetaSequenceNumber	4 byte integer	The sequence number identifying the metadata packet containing additional information for this band. A value of -1 or `0xFFFFFFFF` indicates that there is no associated metadata packet.
12	StartTime	8 byte unsigned integer	The time in nanoseconds from the epoch (1970-01-01 00:00:00 UTC) of the data which this packet contains
20	Latitude	4 byte signed integer	The latitude in micro-degrees of the device producing the data found in the body of the packet
24	Longitude	4 byte signed integer	The longitude in micro-degrees of the device producing the data found in the body of the packet
28	Altitude	2 byte signed integer	The altitude in metres of the device producing the data found in the body of the packet
30	DataSource	4 byte model number and serial number	The URI of the device which originally produced the data; `0xE8` *modelNum serialNum serialNum* where model numbers: 11 = Taurus, 13 = Trident 305

Table 4-1 Packet header format (Continued)

Offset	Field	Data type	Description
34	Band Name	byte	The URI of the band to which this packet belongs; `0x89`, `0x8B`, or `0x8D` for `"band/timeseries1/"`, `"band/timeseries2/"`, or `"band/timeseries3/"` respectively
35	PacketExtensionBlock	short	Set to `0x00 0x00` for seismic data to indicate not used.

4.2   Data payload

A seismic data payload is comprised of a fixed payload header block, containing 2 payload header extensions, and a payload body.

4.2.1   Payload header

Table 4-2 Payload header format

Offset	Field	Data type	Description
37	PayloadSize	2 byte unsigned integer	Indicates the total size of the payload including itself, the rest of the header including the extension block, and the data; 206 or 462, depending on payload body size
39	Payload Name	byte	Set to `0x00` to indicate not used as there is only one payload for a seismic data packet
40	PayloadMediaType	byte	Indicates the media type of data in the payload; for seismic data is Steim1 Encoded Time-Series `0x83` `"application/dns.ca.nmx.steim1"`
41	PayloadExtensionBlock	Extension Block length	Provides a means of adding additional payload-specific fields to a payload; `0x00 0x08`
43	NumberSamples	4 bytes	Number of samples in this packet `0x05 0x87` *numSamples numSamples* `"http://nmx.ca/04/NP/numSamples"`
47	SampleRate	4 bytes	Sample rate used for data in this packet `0x05 0x85` *sampleRate sampleRate* `"http://nmx.ca/04/NP/sampleRate"`

4.2.2   Payload body

The seismic data payload body consists of 3 or 7 frames of Steim1 compressed data (without the 64 byte space for standard SEED headers) as described in Appendix B of the SEED manual (http://www.iris.edu/manuals/SEEDManual_V2.4.pdf). The receiving application must add the standard headers to produce a valid MiniSEED data record. The seismic data payload body starts at offset of 51.