SmartScan UDP data message format

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1 Overview

SmartScan sends data to a host PC via UDP messages over Ethernet. The data messages contain raw (spectral) or processed (FBG peak) data.

Many of the set up parameters as well as the peak values are expressed as “LASER channel numbers”, these are multiplied by 128 to give a resolution that fits into a two byte value e.g. Channel 399 * 128 = 51072, whereas 2^{16} = 65536. Peak values are returned with a fractional portion of a whole channel when divided by 128 by the PC interface.

The wavelength range of the SmartScan is divided up into 400 channels spaced at about 100 pm (12.5 GHz).

Laser channel	Frequency (GHz)	Wavelength (nm)
0	191125.0	1568.567
1	191137.5	1568.465
2	191150.0	1568.362
:		
397	196087.5	1528.871
398	196100.0	1528.773
399	196112.5	1528.676

2 Peak data

2.1 Operation

- SmartScan sends using UDP port 30071 to the configured client IP address on port 30002.
- PC should listen on port 30002 for messages.
- PC does not need to transmit messages. SmartScan does not respond to PC messages.
- PC should set the SmartScan's client IP address using HTTP interface to enable the data transfer.

2.2 Format

UDP payload consists of a header of 36 bytes (see below) followed by N bytes (N/2 16 bit words) of data. A payload will contain an integer number of complete scans.

Example: Take an 8 grating, 4 channel system. Each sample block will contain 8 x 4 = 32 data words. Because of Ethernet size limitations, only up to 22 such sample blocks can be included in each UDP payload.

```
struct  DATA
{
        u16     usFrameSize;        // Total number of bytes
        u8      ucHdrSizex4;        // Number of bytes in header/4 (9)
        u8      ucFrameFormat;      // eg 0x84, 8gratings, 4channels
        u32     ulFrameCount;       // Incremented number
        u32     ulTimeStampH;       // UTC seconds H (scan time)
        u32     ulTimeStampL;       // UTC second  L (scan time)
        u32     ulTimeCodeH;        // UTC seconds   (tx time)
        u16     usTimeInterval;     // sample interval in µS, ie 400
        u16     usSpare;            //
        u16     usMinChannel;       // First LASER step, eg 0
        u16     usMaxChannel;       // Last LASER step, eg 399
        u32     ulStartFreq;        // LASER start frequency
        u32     ulStepFreq;         // LASER step frequency
};
```

usFramesize Total number of bytes.
Value: (data words * 2) + 36

ucHdrSizex4	Number of bytes in header / 4 **Value:** 9
ucFrameFormat	MSB = number of gratings, LSB = number of channels. If MSB = 0 it is 16 gratings **Value:** 0x84 = 8gr/4ch, 0x04 = 16gr/4ch
ulFrameCount	Incremented frame count **Value:** 1,2,3....
usTimeInterval	Sample interval in µs, time for one scan **Value:** 400 for 400µs.
usSpare	Not used
ulStartFreq	Lowest LASER frequency (i.e. emission frequency at LASER channel 0) Start frequency (THz) = (ulStartFreq >> 16) + ((ulStartFreq & 0xFFFF) / 1000)
ulStepFreq	LASER step frequency (i.e. difference in emission frequency between LASER channels) Step frequency (GHz) = (ulStepFreq >> 16) + ((ulStepFreq & 0xFFFF) / 1000)
Data	Header is followed by 2 bytes of data per grating, per scan,representing the “channel number * 128”, see section 1 Overview for more details. Note the offset from LASER channel 0 is set by maintenance command 8, if not 0, then it must be added as an offset to the data values.

In our 8 grating, 4 channel example the data order would be:
Ch1Gr1, Ch1Gr2…Ch1Gr7, Ch1Gr8, Ch2Gr1, Ch2Gr2…Ch2Gr8, Ch3Gr1…Ch3Gr8, Ch4Gr1…Ch4Gr8
The data order is then repeated for the 2nd to 22nd samples.

The UTC time-stamp applies to the first sample in the message, the PC can generate timestamps for the remaining samples by adding multiples of the time interval.

3 Spectrum data

3.1 Operation

- SmartScan sends using UDP port 30071 to the configured client IP address on port 30072.
- PC should listen on port 30072 for messages.
- PC does not need to transmit messages. SmartScan does not respond to PC messages.
- PC should set the SmartScan's client IP address using HTTP interface to enable the data transfer.

3.2 Format

UDP payload consists of a header of 36 bytes (see below) followed by NrSteps number of words of scan data. Scan data are unsigned 16 bit words in network (big endian) format. Each unsigned word represents intensity of light at the output of the receiver circuit after gain has been applied.

```
struct SPECTRUM
{
        u16     usFrameSize;        // Total number of bytes - 2
        u8      ucHdrSizex4;        // Number of bytes in header/4 (9)
        u8      ucFrameFormat;      // Scan source optical channel
        u32     ulFrameCount;       // Incremented on every message
        u32     ulTimeStampH;       // UTC seconds H (scan time)
        u32     ulTimeStampL;       // UTC seconds L (scan time)
        u32     ulTimeCodeH;        // UTC seconds   (transmit time)
        u16     usTimeInterval;     // scan time interval µs
        u16     usNrSteps;          // Steps per scan
        u16     usMinChannel;       // First LASER step
        u16     usMaxChannel;       // Last LASER step
        u32     ulUnused1;          // 0
        u32     ulUnused2;          // 0
};
```