VBAN PROTOCOL
VB-Audio Network Protocol

SPECIFICATIONS

OFFICIAL WEBSITE
www.voicemeeter.com
www.vb-audio.com
Table of Content

INTRODUCTION: .............................................................................................................................. 3
VBAN Capabilities: .......................................................................................................................... 3
VBAN Protocol Basis: ......................................................................................................................... 3
VBAN as industrial solution: ............................................................................................................. 3
Licensing: ........................................................................................................................................ 4
VBAN Packet Structure: .................................................................................................................... 4
VBAN Packet Header: .......................................................................................................................... 5
VBAN Packet DATA: ............................................................................................................................ 6
HEADER fields: ...................................................................................................................................... 7
  Header: Sample Rate ........................................................................................................................ 7
  Header: Sub Protocol: ......................................................................................................................... 7
  Header: Number of samples .............................................................................................................. 8
  Header: Number of channels: .......................................................................................................... 8
  Header: Bit Resolution: .................................................................................................................... 8
  Header: CODEC: .............................................................................................................................. 9
  Header: Stream Name: ..................................................................................................................... 9
  Header: Frame Counter .................................................................................................................... 9
Implementation Details ...................................................................................................................... 10
  Network Quality and Stack size ..................................................................................................... 11
VBAN sub protocol: SERIAL ........................................................................................................... 13
  Serial Header: SR gives BPS ........................................................................................................... 13
  Serial Header: channel ident: ......................................................................................................... 13
  Serial Header: COM Port configuration ......................................................................................... 14
  Serial Header: format bit: ............................................................................................................... 14
  Header: SERIAL type: .................................................................................................................... 15
  Header: Stream Name: .................................................................................................................... 15
  Header: Frame Counter .................................................................................................................... 15
  SERIAL stream in MIDI mode: ......................................................................................................... 16
INTRODUCTION:

VBAN Protocol has been designed for real-time transport of digital audio stream in IP-based network environments. This has been introduced by VB-Audio Software (Vincent Burel) in June 2015 as a new feature of the Application called Voicemeeter: The Virtual Audio Mixer for Windows (www.voicemeeter.com). It provides easy ways to send / receive audio to / from any computers on a local network.

VBAN Capabilities:

VBAN Protocol is using simple UDP packets to send and receive audio stream(s) over IP-based network. The UDP packet is made by a 28 Bytes Header and various amounts of data behind.

VBAN first implementation (in Voicemeeter) supports native 16bits/24bits PCM audio format in any standard sample rate, for 1 to 8 channels stream.

VBAN Protocol Basis:

VBAN protocol is a true broadcast protocol and does not need any other management than the audio packets processing. The audio stream is defined by an IP Address (to or from) and a Name (16 ASCII CHAR max).

VBAN protocol does not need any special infra–structure and works with any switch or router. QOS is given by the capabilities of the network to route and deliver packet as fast as possible.

VBAN protocol includes no clock and no synchronization process. Like in the radio world, every sender is master and every receiver is slave. The slave is in charge to follow the incoming audio data rate….

VBAN as industrial solution:

VBAN protocol needs a simple UDP / IP stack and can be implemented on very small devices or DSP units easily.
Licensing:
VBAN Protocol base, described in this document, is free to use AS IS. Under this free license, the VBAN protocol base includes:

- The AUDIO protocol with PCM Audio formats.
- The SERIAL protocol (including M.I.D.I.).
- The TEXT protocol.

All other protocols or other audio formats (e.g. AOIP / VOIP codec), are not part of this license. All the other rights not expressly stipulated by this License are reserved by Vincent BUREL, for instance the right to modify or enhance the protocol with private or public codec.

Vincent Burel guarantees the compatibility of the current specifications in the time. Voicemeeter can be considered as Test / Validation tool for the current AUDIO PCM protocol implementation.

For implementation / integration questions, you can visit our forum or contact us by e-mail (www.vb-audio.com).

VBAN Packet Structure:

VBAN Packet is a UDP packet composed by a 28 bytes header and a various amount of data after.
VBAN Packet Header:
VBAN Packet header starts by the four letters ‘V’, ‘B’, ‘A’, ‘N’. Then it gives the format of the audio packet: Samplerate, number of Samples, number of multiplexed channels, audio data type, the Stream Name (16x chars) and an optional frame stamp.

Composition of the VBAN 28 Bytes header:

FOURC:: V B A N 4 bytes header
SR / sub protocol:  5 bits for SR index, 3 bits for sub protocol selection.
nb Sample per frame:  8 bits unsigned integer (0 to 255 fits 1 to 256 samples).
nb Channels:  8 bits unsigned integer (0 to 255 fits 1 to 256 channels).
Data format / codec  3 bits for data format, 1 bit reserved, 4 bits for Codec selector.
Stream Name:: String 16 char name (ASCII)
Frame Counter     32 bits unsigned integer growing counter

‘C’ Structure to manage VBAN header.

typedef struct tagVBAN_HEADER
{
    unsigned long vban;  // contains 'V' 'B', 'A', 'N'
    unsigned char format_SR;  // SR/Protocol index (see below)
    unsigned char format_nbs;  // nb sample per frame (1 to 256)
    unsigned char format_nbc;  // nb channel (1 to 256)
    unsigned char format_bit;  // Codec / data format (see table below)
    char streamname[16];  // stream name
    unsigned long nuFrame;  // growing frame number.
} T_VBAN_HEADER, *PT_VBAN_HEADER, *LPT_VBAN_HEADER;

#define expectedsize_T_VBAN_HEADER (4 + 4 + 16 +4)

REM: VBAN protocol has been developed on x86 architecture. Data storage is consequently following little-endian rules (least significant bytes are stored on first memory addresses).

IMPORTANT CONSTRAINT:

The VBAN Header is followed by the audio data in the format defined in this header. For Ethernet V2, The entire UDP packet might be smaller than 1472 Bytes (1500 bytes MTU - 20 bytes for IP header - 8 bytes for UDP header) to avoid possible packet fragmentation by the network infrastructure. Voicemeeter VBAN Implementation is using 1500 - 64 = 1436 Bytes Max (as effective data size limitation). It lets at least 2x 4 bytes free for VLAN tags or other tunneling process.

VBAN PACKET MAX SIZE = 1436 + 28 = 1464 BYTES
VBAN DATA MAX SIZE = 1436 BYTES

To respect this limitation, it’s up to the sender process to adjust the number of samples/data it can send in a single packet.
VBAN Packet DATA:
VBAN Packet data are following the header: data size = Packet size – VBAN header size.

PCM AUDIO DATA STRUCTURE:
Samples are stored multiplexed according the number of channels (exactly like in WAVE File format). Consequently the sample size is pending on data type (16 bits, 24 bits…) and number of channels. The sample size for 8 channel 16 bits PCM audio is 8x 2 = 16 Bytes.

If we consider the 1436 BYTES limit for VBAN Data size, we can store only 89 samples 16 bits PCM 8 channels (7.1) while we could store 359 of 16 bits Stereo samples. However the VBAN protocol is limited to 256 samples per packet.
HEADER fields:

Packet identification: the four first byte are forming the name "VBAN"

header.vban='NABV';

Header: Sample Rate

header.format_SR = SR_index;

Sample Rate is given by an index (0 to 31) given in the 5 first bits. Bits 6 to 7 must be ZERO.

<table>
<thead>
<tr>
<th>Bit number</th>
<th>7</th>
<th>6</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit Value</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#define VBAN_SR_MAXNUMBER 21

static long VBAN_SRList[VBAN_SR_MAXNUMBER]=
{6000, 12000, 24000, 48000, 96000, 192000, 384000,
8000, 16000, 32000, 64000, 128000, 256000, 512000,
11025, 22050, 44100, 88200, 176400, 352800, 705600};

<table>
<thead>
<tr>
<th>index</th>
<th>SR</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>6000 Hz</td>
</tr>
<tr>
<td>1</td>
<td>12000 Hz</td>
</tr>
<tr>
<td>2</td>
<td>24000 Hz</td>
</tr>
<tr>
<td>3</td>
<td>48000 Hz</td>
</tr>
<tr>
<td>4</td>
<td>96000 Hz</td>
</tr>
<tr>
<td>5</td>
<td>192000 Hz</td>
</tr>
<tr>
<td>6</td>
<td>384000 Hz</td>
</tr>
<tr>
<td>7</td>
<td>8000 Hz</td>
</tr>
<tr>
<td>8</td>
<td>16000 Hz</td>
</tr>
<tr>
<td>9</td>
<td>32000 Hz</td>
</tr>
<tr>
<td>10</td>
<td>64000 Hz</td>
</tr>
<tr>
<td>11</td>
<td>128000 Hz</td>
</tr>
<tr>
<td>12</td>
<td>256000 Hz</td>
</tr>
<tr>
<td>13</td>
<td>512000 Hz</td>
</tr>
<tr>
<td>14</td>
<td>11025 Hz</td>
</tr>
<tr>
<td>15</td>
<td>22050 Hz</td>
</tr>
<tr>
<td>16</td>
<td>44100 Hz</td>
</tr>
<tr>
<td>17</td>
<td>88200 Hz</td>
</tr>
<tr>
<td>18</td>
<td>176400 Hz</td>
</tr>
<tr>
<td>19</td>
<td>352800 Hz</td>
</tr>
<tr>
<td>20</td>
<td>705600 Hz</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>index</th>
<th>SR</th>
</tr>
</thead>
<tbody>
<tr>
<td>21</td>
<td>Undefined</td>
</tr>
<tr>
<td>22</td>
<td>Undefined</td>
</tr>
<tr>
<td>23</td>
<td>Undefined</td>
</tr>
<tr>
<td>24</td>
<td>Undefined</td>
</tr>
<tr>
<td>25</td>
<td>Undefined</td>
</tr>
<tr>
<td>26</td>
<td>Undefined</td>
</tr>
<tr>
<td>27</td>
<td>Undefined</td>
</tr>
<tr>
<td>28</td>
<td>Undefined</td>
</tr>
<tr>
<td>29</td>
<td>Undefined</td>
</tr>
<tr>
<td>30</td>
<td>Undefined</td>
</tr>
<tr>
<td>31</td>
<td>Undefined</td>
</tr>
</tbody>
</table>

Header: Sub Protocol:

Bits 5 to 7 of format_SR field are used as sub protocol selector (0 to 7 scaled to 0x00 to 0xE0) should be used to be tested (ZERO = AUDIO PROTOCOL).

#define VBAN_PROTOCOL_AUDIO 0x00
#define VBAN_PROTOCOL_SERIAL 0x20
#define VBAN_PROTOCOL_TXT 0x40
#define VBAN_PROTOCOL_UNDEFINED_1 0x60
#define VBAN_PROTOCOL_UNDEFINED_2 0x80
#define VBAN_PROTOCOL_UNDEFINED_3 0xA0
#define VBAN_PROTOCOL_UNDEFINED_4 0xC0
#define VBAN_PROTOCOL_USER 0xE0
Header: **Number of samples**

\[
\text{header.format_nbs} = \text{nbSample}-1;
\]

Number of sample is given by a 8 bits unsigned integer (0 – 255) where 0 means 1 sample and 255 means 256 samples (all bits are used).

<table>
<thead>
<tr>
<th>Bit number</th>
<th>7</th>
<th>6</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit Value</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Header: **Number of channels:**

\[
\text{header.format_nbc} = \text{nbChannel}-1;
\]

Number of channel is given by a 8 bits unsigned integer (0 – 255) where 0 means 1 channel and 255 means 256 channels (all bits are used).

<table>
<thead>
<tr>
<th>Bit number</th>
<th>7</th>
<th>6</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit Value</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Header: **Bit Resolution:**

\[
\text{header.format_bit} = \text{index};
\]

Data type used to store audio sample in the packet. The index is stored on 3 first bits. Bit 3 must be ZERO. Bits 4 to 7 are used for additional CODEC (see next page).

<table>
<thead>
<tr>
<th>Bit number</th>
<th>7</th>
<th>6</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit Value</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>index</th>
<th>Data type</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>8 bits unsigned integer</td>
<td>0 to 255 (128 = 0)</td>
</tr>
<tr>
<td>1</td>
<td>16 bits Integer</td>
<td>-32768 to 32767</td>
</tr>
<tr>
<td>2</td>
<td>24 bits Integer</td>
<td>-8388608 to 8388607</td>
</tr>
<tr>
<td>3</td>
<td>32 bits Integer</td>
<td>-2147483648 to 2147483647</td>
</tr>
<tr>
<td>4</td>
<td>32 bits float</td>
<td>-1.0 to +1.0 (normal signal)</td>
</tr>
<tr>
<td>5</td>
<td>64 bits float</td>
<td>-1.0 to +1.0 (normal signal)</td>
</tr>
<tr>
<td>6</td>
<td>12 bits integer</td>
<td>-2048 to +2047</td>
</tr>
<tr>
<td>7</td>
<td>10 bits integer</td>
<td>-512 to +511</td>
</tr>
</tbody>
</table>

#define VBAN_DATATYPE_BYTE8   0x00
#define VBAN_DATATYPE_UINT16   0x01
#define VBAN_DATATYPE_INT24    0x02
#define VBAN_DATATYPE_INT32    0x03
#define VBAN_DATATYPE_FLOAT32  0x04
#define VBAN_DATATYPE_FLOAT64  0x05
#define VBAN_DATATYPE_12BITS   0x06
#define VBAN_DATATYPE_10BITS   0x07
Header: CODEC:

Bit 4 to 7 of format_bit field are used to define additional CODEC. (ZERO = no codec = Native PCM audio packet).

```c
#define VBAN_CODEC_PCM   0x00
#define VBAN_CODEC_VBCA   0x10  //VB-AUDIO AOIP CODEC
#define VBAN_CODEC_VBCV   0x20  //VB-AUDIO VOIP CODEC
#define VBAN_CODEC_UNDEFINED_3  0x30
#define VBAN_CODEC_UNDEFINED_4  0x40
#define VBAN_CODEC_UNDEFINED_5  0x50
#define VBAN_CODEC_UNDEFINED_6  0x60
#define VBAN_CODEC_UNDEFINED_7  0x70
#define VBAN_CODEC_UNDEFINED_8  0x80
#define VBAN_CODEC_UNDEFINED_9  0x90
#define VBAN_CODEC_UNDEFINED_10  0xA0
#define VBAN_CODEC_UNDEFINED_11  0xB0
#define VBAN_CODEC_UNDEFINED_12  0xC0
#define VBAN_CODEC_UNDEFINED_13  0xD0
#define VBAN_CODEC_UNDEFINED_14  0xE0
#define VBAN_CODEC_USER   0xF0
```

Header: Stream Name:

```c
header.streamname = szName;
```

The stream name, containing up to 16 ASCII char, is made to identify the stream. This name can be possibly defined by user.

An incoming VBAN stream must be identified by its name and its IP from.

Header: Frame Counter

```c
header.nuFrame = i++;
```

This unsigned 32bits value is there to give a simple frame stamp. For each packet sent in the same stream, just increase this number. This is made for the client application (receiver) to detect possible problem: missing frame, double frame, bad frame order etc…

In our implementation in Voicemeeter, this counter is used to detect error(s) and count them. Since version 1.0.5.3 / 2.0.3.3, it is used to correct the audio stream (discontinuity problem).
Implementation Details

Even if the protocol is simple, VBAN application may have to process a huge amount of packet per second. It is important to implement an optimal process.

While UDP socket is created (bind to a given port, 6980 per default) the listen process will have to check every incoming UDP packet according the following minimal algorithm:

```c
PROCESS_UDP_PACKET(void * packet, long packetsize, SOCKADDR_IN from);
{
    LPT_VBAN_HEADER lpHeader = (LPT_VBAN_HEADER)packet;
    //Detect a VBAN packet in a single 32 bit instruction
    if (lpHeader->vban == 'NABV')
    {
        //check the IP-From and Stream Name (different stream can come in)
        fOk=CheckIfWeProcessThisStream(lpHeader, from);
        if (fOk)
        {
            //get datasize (ater header) and protocol(codec index
            Datasize = packetsize - sizeof(T_VBAN_HEADER);
            protocol = lpHeader->format_SR & VBAN_PROTOCOL_MASK;
            codec = lpHeader->format_bit & VBAN_CODEC_MASK;
            //protocol selector
            if (protocol == VBAN_PROTOCOL_AUDIO)
            {
                //codec selector
                switch (codec)
                {
                    case VBAN_CODEC_PCM:
                        //get audio stream information
                        SR = VBAN_SRList[lpHeader->format_SR & VBAN_SR_MASK];
                        nbChannel = ((long)lpHeader->format_nbc)+1;
                        fReserved = lpHeader->format_bit & 0x08;
                        BitResolution = lpHeader->format_bit & VBAN_DATATYPE_MASK;
                        sampleSize = VBAN_SampleSize[BitResolution];
                        nbSample = ((long)lpHeader->format_nbs)+1;
                        nbyte = sampleSize * nbChannel * nbSample;
                        //Push Data in Audio Stack (to be sent to audio device output for
                        //example) NOTE that waiting cycles are not allowed in this thread.
                        if (fReserved == 0)
                        {
                            if (nbyte == datasize)
                            {
                                MyStream_PushSignal(pStreamObj, lpHeader+1, nbyte,
                                SR, nbChannel, BitResolution);
                            }
                            else nError_corrupt++
                        }
                }
            }
        }
    }
}
```
Network Quality and Stack size

By “Network Quality” we are considering the capability of the network (including Ethernet Stack managed by Operating System) to send/receive audio packet as fast as possible and support different buffering sizes.

For 1 to 8 channels streaming (as it is implemented in Voicemeeter application), packet can contain up to 256 samples and then applies a minimal stack of 3 x 256 samples.

#define VBAN_PROTOCOL_MAXNBS 256

Voicemeeter proposes 5 Network Quality Level conditioning the stack size for incoming packet starting by 6x 256 samples (Audio Pro Stack, managing 32, 64, 128 or more channel could be smaller). This is subject to change in the time but the current stack size (nnn) in Voicemeeter is following the algorithm below.

nnn= current audio buffer size
nmin = 6 * VBAN_PROTOCOL_MAXNBS;
switch(pStream->format.networkquality)
{
    case 0://Optimal
        if (nnn < 512) nnn=512;
        break;
    case 1://Fast
        if (nnn < 1024) nnn=1024;
        break;
    case 2://Medium
        if (nnn < 2048) nnn=2048;
        break;
    case 3://Slow
        if (nnn < 4096) nnn=4096;
        break;
    case 4://Very Slow
        if (nnn < 8192) nnn=8192;
        break;
}
nnn=nnn*3;
if (nnn < nmin) nnn=nmin;

For general audio stream management, we are obliged to use big stack to fit the different possible buffering size used by audio applications. Default audio buffering on windows is around 512 to 1024 samples. So we might consider receiving burst of 2, 3 or 4 VBAN packets at a time, simply because audio buffering is 2, 3, or 4 time 256 samples (max size for a VBAN packet).
VBAN SUB PROTOCOL

SERIAL
VBAN sub protocol: SERIAL

VBAN Packet header can be used to send serial data by using the sub protocol field:

#define VBAN_PROTOCOL_SERIAL : 0x20

Some members of the header are consequently used in different way to describe the SERIAL stream.

Serial Header: SR gives BPS

header.format_SR = bps_index;

Bit rate is given in bps for information only. But it can be useful if serial data come from or go to a particular COM port. Set to ZERO if there is no particular bit rate.

Bit number 7 6 5 4 3 2 1 0
Bit Value 0 0 1

#define VBAN_BPS_MAXNUMBER 25

static long VBAN_BPSList[VBAN_BPS_MAXNUMBER]=
{0, 110, 150, 300, 600, 1200, 2400, 4800, 9600, 14400, 19200, 31250, 38400, 57600, 115200, 128000, 230400, 250000, 256000, 460800, 921600, 1000000, 1500000, 2000000, 3000000};

<table>
<thead>
<tr>
<th>index</th>
<th>SR</th>
<th>index</th>
<th>SR</th>
<th>index</th>
<th>SR</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0 bps</td>
<td>7</td>
<td>4800 bps</td>
<td>14</td>
<td>115200 bps</td>
</tr>
<tr>
<td>1</td>
<td>110 bps</td>
<td>8</td>
<td>9600 bps</td>
<td>15</td>
<td>128000 bps</td>
</tr>
<tr>
<td>2</td>
<td>150 bps</td>
<td>9</td>
<td>14400 bps</td>
<td>16</td>
<td>230400 bps</td>
</tr>
<tr>
<td>3</td>
<td>300 bps</td>
<td>10</td>
<td>19200 bps</td>
<td>17</td>
<td>250000 bps</td>
</tr>
<tr>
<td>4</td>
<td>600 bps</td>
<td>11</td>
<td>31250 bps</td>
<td>18</td>
<td>256000 bps</td>
</tr>
<tr>
<td>5</td>
<td>1200 bps</td>
<td>12</td>
<td>38400 bps</td>
<td>19</td>
<td>460800 bps</td>
</tr>
<tr>
<td>6</td>
<td>2400 bps</td>
<td>13</td>
<td>57600 bps</td>
<td>20</td>
<td>921600 bps</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>index</th>
<th>SR</th>
<th>index</th>
<th>SR</th>
<th>index</th>
<th>SR</th>
</tr>
</thead>
<tbody>
<tr>
<td>21</td>
<td>1000000 bps</td>
<td>25</td>
<td>Undefined</td>
<td>29</td>
<td>Undefined</td>
</tr>
<tr>
<td>22</td>
<td>1500000 bps</td>
<td>26</td>
<td>Undefined</td>
<td>30</td>
<td>Undefined</td>
</tr>
<tr>
<td>23</td>
<td>2000000 bps</td>
<td>27</td>
<td>Undefined</td>
<td>31</td>
<td>Undefined</td>
</tr>
<tr>
<td>24</td>
<td>3000000 bps</td>
<td>28</td>
<td>Undefined</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Serial Header: channel ident:

header.format_nbc = channel ident;

Can be used to defined a sub channel (sub serial link) and then manage up to 256 different serial virtual pipes (ZERO by default).
Serial Header: COM Port configuration

header.format_nbs = bitmode;

This field is used to give possible information on COM port and serial transmission mode related to a COM port. This is made to possibly virtualize COM to COM port connections and let the receiver configure the COM port in the right mode.

<table>
<thead>
<tr>
<th>Bit number</th>
<th>7</th>
<th>6</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit Value</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Bit 0-1: STOP BIT
- 0: 1 stop bit
- 1: 1.5 stop bit.
- 2: 2 stop bit.
- 3: unused.

Bit 2: START BIT
- 0: no start bit
- 1: start bit.

Bit 3: PARITY CHECKING:
- 0: no parity checking
- 1: parity checking.

Bit 7: MULTIPART DATA BLOCK (optional)
- Set to 1 if the serial data block requires several VBAN Packets (1436 BYTE max) to be completed.

Serial Header: format bit:

header.format_bit = index;

Data type used to store data in the packet (ZERO per default). The index is stored on 3 first bits. Bit 3 must be ZERO. Bits 4 to 7 gives additional mode.

<table>
<thead>
<tr>
<th>Bit number</th>
<th>7</th>
<th>6</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit Value</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>index</th>
<th>Data type</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>8 bits data</td>
<td>0 to 255</td>
</tr>
<tr>
<td>1</td>
<td>Undefined</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Undefined</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Undefined</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Undefined</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>undefined</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>undefined</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>undefined</td>
<td></td>
</tr>
</tbody>
</table>

#define VBAN_DATATYPE_BYTE8 0x00
Header: SERIAL type:

Bit 4 to 7 of format_bit field are used to define additional type of serial. *(ZERO = generic).*

```c
#define VBAN_SERIAL_GENERIC 0x00
#define VBAN_SERIAL_MIDI 0x10
#define VBAN_SERIAL_UNDEFINED_2 0x20
#define VBAN_SERIAL_UNDEFINED_3 0x30
#define VBAN_SERIAL_UNDEFINED_4 0x40
#define VBAN_SERIAL_UNDEFINED_5 0x50
#define VBAN_SERIAL_UNDEFINED_6 0x60
#define VBAN_SERIAL_UNDEFINED_7 0x70
#define VBAN_SERIAL_UNDEFINED_8 0x80
#define VBAN_SERIAL_UNDEFINED_9 0x90
#define VBAN_SERIAL_UNDEFINED_10 0xA0
#define VBAN_SERIAL_UNDEFINED_11 0xB0
#define VBAN_SERIAL_UNDEFINED_12 0xC0
#define VBAN_SERIAL_UNDEFINED_13 0xD0
#define VBAN_SERIAL_UNDEFINED_14 0xE0
#define VBAN_SERIAL_USER 0xF0
```

Header: Stream Name:

```c```

```c
header.streamname = szName;
```

The stream name, containing up to 16 ASCII char, is made to identify the stream. This name can be possibly defined by user.

An incoming VBAN stream must be identified by its name (and possibly by its IP from). For SERIAL Stream, it's up to the receiver to identify the stream strictly with IP and name or just by name… It can be interesting to be able to manage VBAN SERIAL stream by its name only, because allowing multi remotes system (the ability for the receiver to be controlled by multiple devices, including MIDI devices…).

Header: Frame Counter

```c```

```c
header.nuFrame = i++;
```

This unsigned 32bits value is there to give a simple frame stamp. For each packet sent in the same stream, just increase this number. This is made for the client application (receiver) to detect possible problem: missing frame, double frame, bad frame order etc…
SERIAL stream in MIDI mode:

If transmitting MIDI data, configure format_bit field with VBAN_SERIAL_MIDI value.

Optionally you may set format_SR field with the MIDI bit rate (31250 bps) and set format_nbs field in the regular MIDI port mode: 1 start bit, 1 stop bit, no parity.

A VBAN packet must contain one or several entire MIDI messages (up to 1436 bytes max). a VBAN packet can then contains a list of several Note-On, Note-Off, Pitch Bend, Controller or other MIDI message.

If the MIDI message cannot enter in a single packet (for SYSEX for example), set the bit 7 of format_nbs field. Then the receiver will be able to rebuild the complete packet before processing it.