Arbitrary Frequency Clock Stream Format

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What is it

- A way to carry any arbitrary idealized digital clock across the AVB cloud
  - Generates a transposed version of the clock at all of the listeners
- Could also be used to carry an arbitrary binary input across the network
How it works

- Each stream frame carries one or more clock pulses as a set of two timestamps
  - One time stamp for the rising edge of the clock and one for the falling edge
  - Each timestamp is a 64-bit in nanoseconds gPTP based time of when the rising/falling edge of the clock crosses the listeners presentation time plane

- Source of the timestamps does not need to be a physical pin, it could be a counter within the talker
What the signals look like

talker input

listener 1 output

listener 2 output

talker internal latency + packetization time + presentation time + listener internal latency
(discoverable by 1722.1)
Packet Format

<table>
<thead>
<tr>
<th>00</th>
<th>subtype data</th>
</tr>
</thead>
<tbody>
<tr>
<td>04</td>
<td>Stream ID</td>
</tr>
<tr>
<td>08</td>
<td>AVTP Time</td>
</tr>
<tr>
<td>12</td>
<td>Gateway Info</td>
</tr>
<tr>
<td>16</td>
<td>Packet Info</td>
</tr>
<tr>
<td>20</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td></td>
</tr>
<tr>
<td>32</td>
<td></td>
</tr>
</tbody>
</table>

Clock Edge

Data

Stream data length + 24
The Fields

- **gv, pull & base_frequency**
  - The frequency of the clock signal
  - Same format as sampling rate in 1722.1
  - gv indicates if the pull & base_frequency contain a valid value

- **tv & avtp_timestamp**
  - tv is always 0
  - avtp_timestamp is not used
The Fields (cont)

- **rv**
  - first Rising edge time Valid, the first rising edge time in the packet contains a valid value

- **fv**
  - last Falling edge time Valid, the last falling edge time in the packet contains a valid value

- **ab**
  - Arbitrary Binary signal, rather than transporting a clock it is a single bit binary signal
The Fields (cont)

- **number_of_pulses**
  - The number of values (rising edge and falling edge times) contained in the frame

- **rising_edge_time[N]** the nth rising edge time (gPTP time of the low to high transition)

- **falling_edge_time[N]** the nth falling edge time (gPTP time of the high to low transition)
Timestamps

- Timestamps are in nanoseconds and based on the gPTP clock
  - similar to avtp_timestamp field but with more bits
  - \((\text{AS}_{\text{sec}} \times 10^9 + \text{AS}_{\text{ns}}) \mod 2^{64}\)
Pros and Cons

- **Pros**
  - Transports an arbitrary clock which could be used for a media clock (but could be other clocks, such as GPS PPS, etc.)
  - Easily adapted (the ab flag) to carry an arbitrary single bit input
  - Easily fed into regeneration software or hardware

- **Cons**
  - Can be larger than an empty media stream
Possible Optimizations

- assume a single edge clock, add a bit which says if it is a rising edge or falling edge clock and limit timestamps to a single edge
  - single bit digital transport doesn’t work with this
- make the timestamp 63 bits with the upper bit used to indicate rising or falling edge
  - a basic clock can have a single edge
  - an still transport single bit digital