RTP Payload Format for Bluetooth's SBC audio codec
draft-hoene-avt-rtp-sbc-00

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Advanced Audio Distribution Profile (A2DP)

- For streaming of high quality audio via a Bluetooth connections
- **Sub-band coding** (**SBC**)
  - mono and stereo audio coding
  - low complexity
  - A2DP mandatory
- A2DP optionally supports
  - MP3, MPEG-2, MPEG-4, AAC, ATRAC, and other manufacturer-defined codecs
  - Content protection
- Implemented for
  - Linux, Mac OS X, Palm OS, Symbian Series60, Motorola P2K, UIQ 3.0 (Symbian 9.1), Windows Mobile, XP, Vista, Black Berry

[A2DPV12] Bluetooth SIG, "Advanced Audio Distribution Profile Specification", Audio Video WG, revision V12, April 16th, 2007.

RTP Payload Format for Bluetooth SBC codec

- Usage Scenarios
  1. Interconnecting A2DP devices over the Internet
  2. Internet telephony at CD quality
  3. Distributed ensemble performances over the Internet

- Musicians require
  - perfect audio quality
  - not sitting more than 8 meters apart
  - 8m at sonic speech = 25 ms latency
    = 7500 km at speed of light

- Algorithmic latency of SBC is a few ms.
  - would allow musicians to play together
    (e.g., in Europe or across the states)

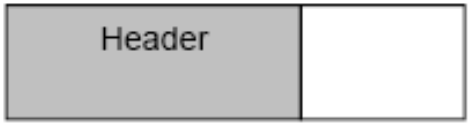
Payload Format follows A2DP Specification

- A2DP follows the RTP payload format
- Request by Morgan Lindvist (chair of Bluetooth‘s AV working group):
  - Please remain 100% compatible with the Bluetooth specification

- SBC specific header followed by SBC frames
  - Header contains parameters on fragmentation and number of SBC frames

(a) When the media payload contains an integral number of SBC frames

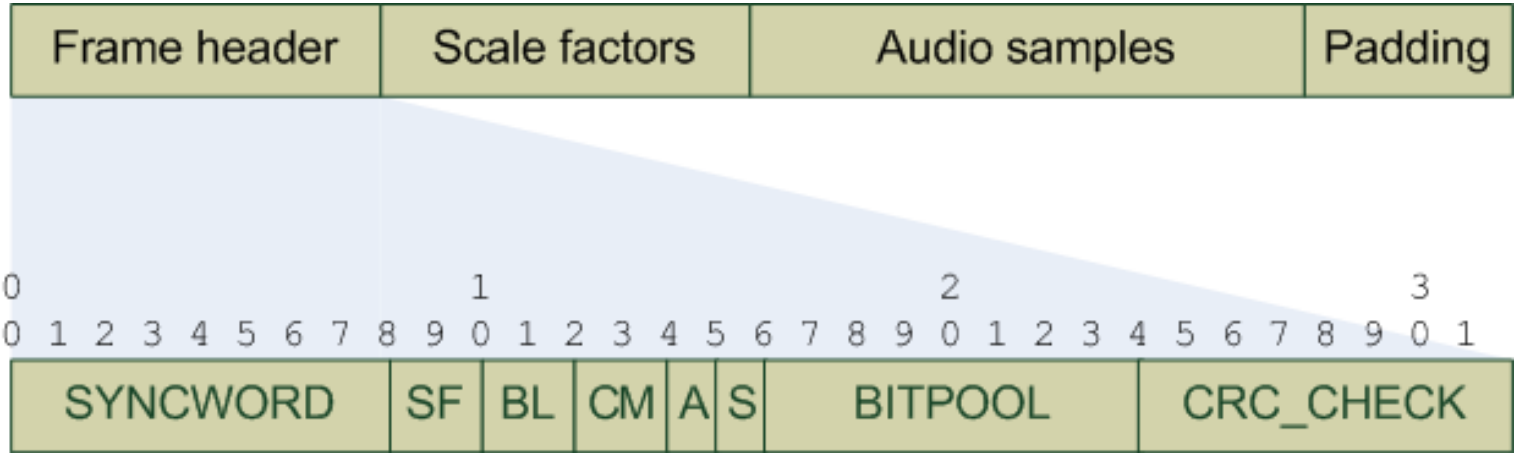
(b) When the SBC frame is fragmented



Subsequent fragments of SBC frame

from [A2DPV12]

Format of a SBC Frame

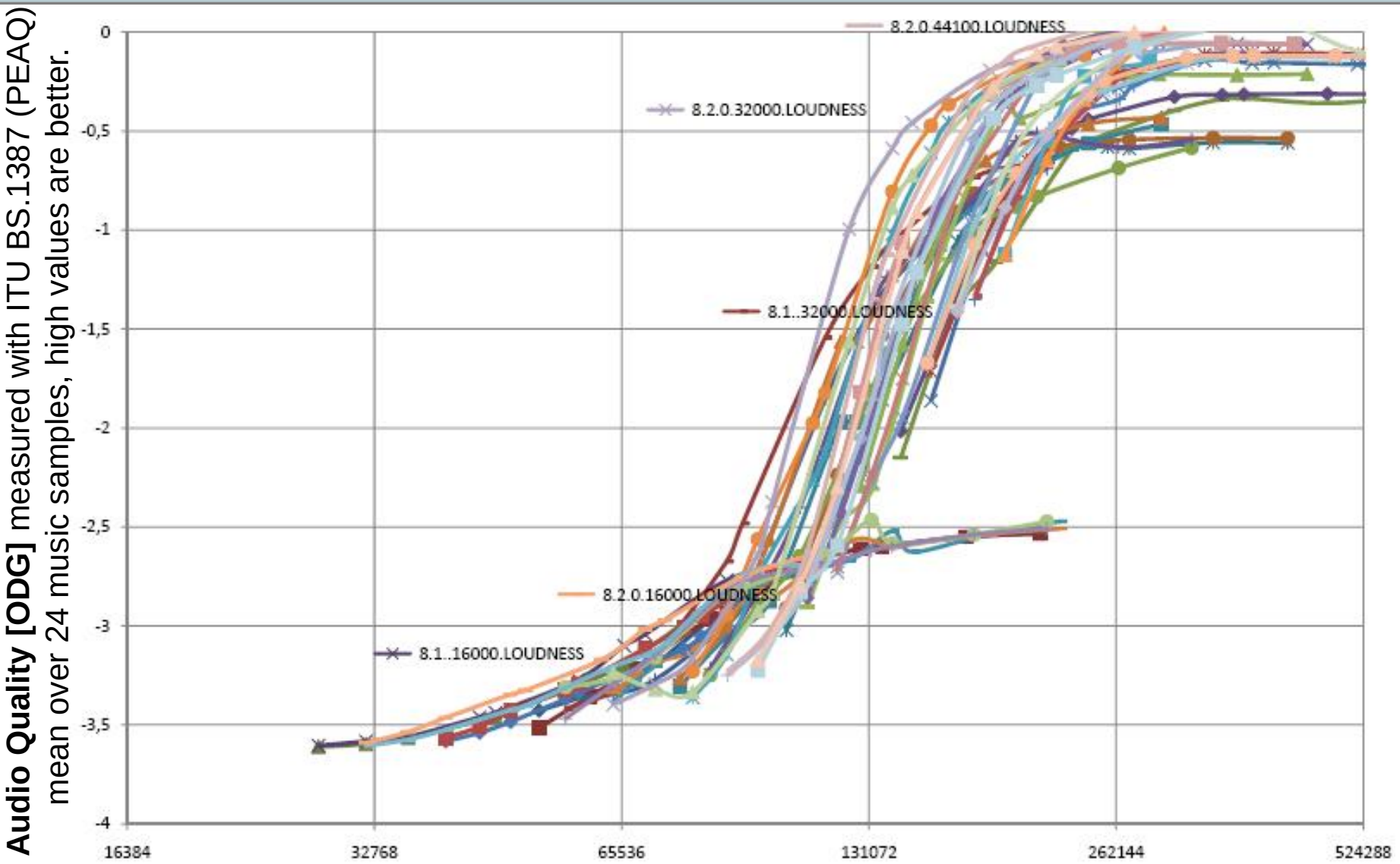


Coding modes

- `SF:` Sampling frequency (16, 32, 44.1, or 48 kHz)
- `BL:` Blocks (4,8,12, or 16)
- `CM:` Channel mode(mono, stereo, joint stereo, dual channel)
- `A:` bit allocation method (SNR or loudness)
- `S:` Number of sub-bands (4 or 8)
- `SYNCWORD:` is %10011100
- `BITPOOL:` defines the number of bits used for encoding (2 and 250)
- `CRC_CHECK:` performed on the header flags

- all but `BITPOOL` and `CRC_CHECK` MUST NOT change during a session.

Which Coding Mode?



Selecting one Coding Mode in the SDP Negotiation

- A2DP negoticates capabilities by setting one bit for each possible parameter values.
  - e.g. for 4 bits for 16, 32, 44.1, 48 kbps

7	6	5	4	3	2	1	0	
Sampling Frequency				Channel Mode				Octet0
Block Length				Subbands		Allocation Method		Octet1
Minimum Bitpool Value								Octet2
Maximum Bitpool Value								Octet3

Figure 4.1: Codec Specific Information Elements for SBC

from [A2DPV12]

- Using the same bytes for SDP negotiation
  - Plus payload type, sampling rate and channels.
- Example

Offer: SBC all modes

m=audio 54874 RTP/AVP 96

a=rtpmap:96 SBC/48000/2

a=fmtp:96 capabilities=FF,FF,02,FA

Answer: wants 44.1 kHz, mono, 16 blocks, 8 subbands, LOUDNESS, bit-pool value set to 19

m=audio 59452 RTP/AVP 96

a=rtpmap:96 SBC/44100/1

a=fmtp:96 capabilities=28,15,13,13

Summary

- SBC is a nice codec with unique features:

1. Good stereo audio quality
2. Low complexity
3. Ultra low algorithmic delay (a few milliseconds)
4. Flexible bit rate selection on congested paths
5. Open source code included in Linux BlueZ protocol stack
6. Already included in Ekiga‘s development track
7. License: Free to use in Bluetooth applications

BlueZ
Official Linux Bluetooth protocol stack

Ekiga

Any comments and feedback?