Scalable Quality Extension for the Opus codec (Opus HD)

`draft-valin-opus-scalable-quality-extension-03`

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IETF 123

Scalable Quality Proposal

- Extension that lifts some limits of the Opus bitstream
  - Support > 8 bits band-wise depth
  - Support for > 20 kHz bandwidth
  - Bitrate up to ~500 kb/s per channel
- Compatibility
  - Keep forward and backward compatibility with RFC6716

Payload

- Long extension ID (124)
- Entropy coded payload

Symbol(s)	PDF/Description
96 kHz flag	{1, 1}/2
Intensity stereo	uint
Dual stereo	{1, 1}/2
Intra coarse energy	{7, 1}/2
Coarse energy (high bands)	
Bit allocation	Section 2.3
Fine energy (low bands)	Section 2.1.1
PVQ refinement	Section 2.1.2, Section 2.1.3
Fine energy (high bands)	Section 2.3
PVQ and cubic codebook (high bands)	Section 2.1.4

Update: Conformance

- Testvector material (96 kHz, floating point)
  - 3 synthetic clips (sine sweep, noise, pulses)
  - 1 speech, 2 music clips (synthetically extended to 96 kHz)
- Strict decoder conformance test
- Encoder is non-normative, but we includes optional test

Decoder Conformance (MUST)

- Two sets of 6 testvectors
  1) 1024 kb/s high-quality encoding
  2) Fuzzing encoder sweeping 180 - 1500 kb/s
- Evalute output using qext_compare tool
  - 3 metrics: err4, err16, rms
  - Each must be within threshold
  - Stricter thresholds for first set (high quality)

Encoder Conformance (SHOULD)

- Harder to evaluate – many valid encoder decisions
- Encode original testvectors
  - Compare with qext_compare
  - Looser thresholds than decoder
  - Vector-dependent RMS
- Suggest listening test
  - Show transparency with either ABX or BS. 1116
  - Hard because we cannot prove the null hypothesis

Status

- Running code
  - Branch exp_qext_mr on https://gitlab.xiph.org/xiph/opus/
  - Achieves -115 dB THD+N (AP test) at 480 kb/s/channel
  - Test vectors (based on float implementation) at https://media.xiph.org/opus/ietf/opushd_testvectors.tar.gz
  - qext_compare tool working
  - Fixed-point implementation passes testvectors
- TODO
  - Listening test details