Scalable Quality Extension for Opus/CELT

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Opus Limitations

- Many Opus limits baked into the format (on purpose)
  - Max bitrate around 255 kb/s per channel
  - Max bandwidth 20 kHz
  - Max per-band bit allocation:
    - 8 bits depth at low frequency
    - Down to 3 bits close to 20 kHz
- Non-scalable bit-stream

Scalable Quality Proposal

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

Applications

- Industry/market demand for *premium* codec
- Non-audio applications
  - e.g. ultrasonic sensors
- Scalable bit-stream
  - Can use extension at 48 kHz
  - Allows bitrate *layering*

How?

- Use new extension mechanism to add new layer
- Extension layer with extra information
  - Extends resolution of existing quantizers
    - Decoder uses original quantizer plus refinement
  - Includes extra bands defined above 20 kHz
- Support for 96 kHz sampling rate
  - Has to be a multiple of 48 kHz for compatibility
  - Update to comb filter and preemphasis

Where?

- Part of milestone 4:
  - A specification for improving the quality of CELT-coded audio (both speech and music) through decoder changes, with and without side information provided by the encoder. This will be done in a way that does not affect interoperability between original and extended implementations. This document shall be a Proposed Standard document.

Status

- No draft yet
- ...but running code (prototype)
  - Branch exp_qext16 on https://gitlab.xiph.org/xiph/opus/
- Seeking feedback