IETF117 Hackathon : OPUS / WebRTC

Analyse and integrate
Deep Audio Redundancy (DRED) Extension in Opus in Gstreamer

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I E T F

For use case of spike in loss (heavy jitter) such as burtsy network which could be a result of NAT rebinding or network handover, the audio codec needs to be resistant to heavy loss. One way is to overcome the missing data by synthetically reconstructing long sequences of lost packets.

This is achieved by **Deep REDundancy (DRED)**
which works by adding side information inside the regular Opus packets. OPUS is the default WebRTC audio codec.

More explanation:
https://www.amazon.science/blog/neural-encoding-enables-more-efficient-recovery-of-lost-audio-packets

Hackathon Plan

1. To analyse Deep Audio Redundancy (DRED) Extension for the Opus Codec via PESQ and waveform on large Voice dataset
2. Implement the Coder and Decoder change in Gstreamer base plugin implementation of OPUS

draft-valin-opus-dred-01
https://datatracker.ietf.org/doc/draft-valin-opus-dred/

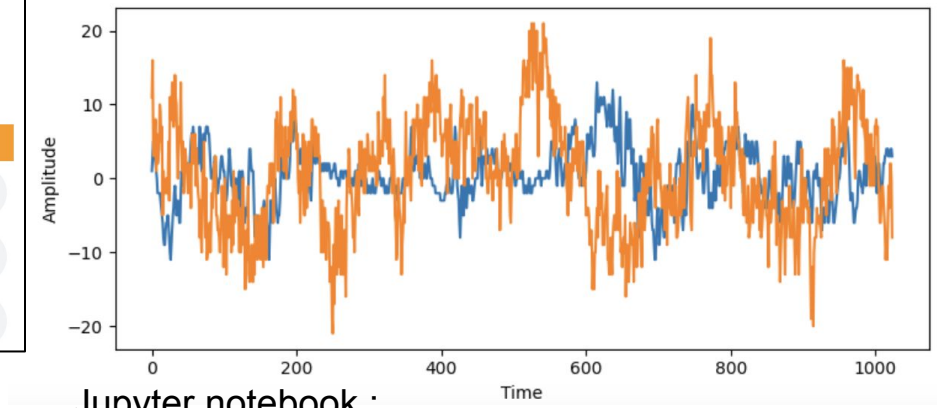
1. To analyse Deep Audio Redundancy (DRED) Extension for the Opus Codec via PESQ and waveform

DataSet: PTDB-TUG size:4GB source: https://www2.spsc.tugraz.at/databases/PTDB-TUG/

OPUS DRED extension reference test

Top 20

Rank	Name	PESQ	Audio (out)	Audio (orig)
1	mic_M10_si2224	4.075	0:00 / 0:06	0:00 / 0:06
2	mic_M10_si2199	4.036	0:00 / 0:05	0:00 / 0:05
3	mic_M07_si1725	4.015	0:00 / 0:05	0:00 / 0:05



Tool Used : lpcnet-testsuite
https://gitlab.xiph.org/xiph/opus/-/tree/opus-ng/dnn/torch/testsuite

Jupyter notebook :
https://github.com/altanai/IETF117-OPUS-APPLICATION/blob/main/AudioWaveform_OPUS-ng.ipynb

2. POC for Coder and Decoder change in Gstreamer plugins-base implementation of OPUS for DRED

Encoder.c :Set `OPUS_SET_DRED_DURATION` `as` 1s and loss percentage to 20%

Also add changes to header file

Decoder Changes : monitor Seq number for loss and invoke `opus_dred_parse` params

OpusDREDDecoder ,
OpusDRED,
data,
len,
max_dred_samples,
sampling_rate,
defer_processing flag

Wrap Up

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- DRED IETF draft: https://datatracker.ietf.org/doc/draft-valin-opus-dred/
- Hacathin repo (work in progress) https://github.com/altanai/IETF117-OPUS-APPLICATION
- Source Code of the OPUS codec with DRED extension https://gitlab.xiph.org/xiph/opus/-/tree/opus-ng?ref_type=heads
- Gstreamer (work in progress - incomplete) https://github.com/altanai/gst-build