Extension Formatting for the Opus Codec

`draft-valin-opus-extension-01`

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Extending Opus

- Goals
  - Support all goals of the mlcodec WG
  - Maintain full compatibility with original specification
  - Make it possible to signal extensions in-band
  - Reasonable future-proofing vs efficiency trade-off
- Proposed solution: transmit extensions as Opus padding
  - No change to the meaning of the other bits
  - Extensions will be ignored by older decoder

Why Compatibility Is Preserved

- From RFC6716
  - “The additional padding bytes [...] MUST be set to zero”
  - “The decoder MUST accept any value for the padding bytes”
- All-zero padding is still interpreted as regular padding

Proposed Format

- Concatenation of extensions
- Each extension contains (byte-aligned)
  - 8-bit header (7-bit ID, L flag)
  - Optional length byte(s) (depending on L)
  - Payload

```
 0                   1                   2                   3
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|      ID     |L| Length (opt.) |    extension content...       |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+                               |
|                                                               |
:                                                               :
|                                                               |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

Extension IDs and L Flag

- ID=0: Padding
  - L=0 → rest of padding must be zeros (original meaning)
  - L=1 → no length or payload follows
- ID=1..31
  - L=0 → no length or payload
  - L=1 → one byte of payload follows
- ID=32..127
  - L=0 → payload fills the rest of the padding
  - L=1 → signal payload length

Assigned IDs

- ID=0: Padding
- ID=1: Frame separator
  - Separates frame extensions in multi-frame packets
- ID=2..119: To be assigned with “standards action” policy
- ID=120..127: “Experimental use” policy

SDP

- General parameters:
  - extensions=<list of IDs>
  - sprop-extensions=<list of IDs>
- Extension-specific parameters:
  - ext*N*-*=<param> and sprop-ext*N*=<param>

Open Questions

- Allow repeat ID for same frame in a packet?
- Should ordering matter?
- Should we pre-define “unsafe” extensions?
  - Similar to draft-ietf-tsvwg-udp-options