transport-wide-cc-extensions-01

{holmer,mflodman,sprang}@google.com
Problem

- All RMCAT drafts propose different specialized RTCP messages. Interop will be difficult.

- Splitting logic between sender and receiver.
  - Makes interop even more difficult.
  - May require synchronized roll-outs of improvements.
  - Running experiments will be simpler.
Where does RMCAT/CC operate?

- Per stream or per transport?
- Mediastreams doesn't really matter. Interested in flows of packets.
- Packets transmitted over the same path.
Why "Transport-level" Congestion Control?

- One CC instance per transport instead of one instance per stream.
  - Up to the sender to decide.
- Streams will not have to fight over bandwidth.
- Tail losses detected earlier.
- Care must be taken regarding:
  - DSCP markings.
  - BUNDLE vs. non-BUNDLE.
Proposal

- Standardize on a single, flexible RTCP message for CC.
- Standardize on running the algorithm logic on the send-side.
- Two components:
  - RTP header extension: transport-wide packet sequence number.
  - RTCP message: arrival-time for every received packet.
RTP Header Extension

- 16 24 bits sequence number.
- Incremented by one for each packet sent on the transport.
RTCP Message

- Transport-wide feedback message.
- Sent X times per RTT or once every ~30 ms.
- Similar to a combination of RTCP XR Loss RLE Report Block and Packet Receipt Times Report Block, but per transport.
Backup Slides
RTCP Message Details

- **Packet Status Symbol -- 2 bits:**
  - 00 - Not received
  - 01 - Packet received, small delta
  - 10 - Packet received, large or negative delta

- **Packet Status Chunks -- 16 bits:**
  - 0 - Run Length Chunk
  - 1 - Status Vector Chunk

Example - run length chunk:
```
0 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5
+----------------------------------------+
|T|S| Run Length |
+----------------------------------------+
```

```
0 0 1 0 0 0 0 0 0 1 1 0 0 0 0 0 0
+----------------------------------------+
|0|0 1|0 0 0 0 0 0 0 0 0 1 1 0 0 0 0 0|
+----------------------------------------+
```
RTCP Message Details

- Reference Time -- 24 bits:
  - One per RTCP Message
  - Multiples of 64 ms
  - Possibility to calculate delta to previous RTCP Messages

- Receive Deltas:
  - Small Delta: [0, 63.75] ms -- 8 bits
  - Large Delta: [-8192.0, 8191.75] ms -- 16 bits
  - The first delta is relative to Reference Time
  - Others are relative to the previous Delta
Less Self-induced Jitter?