# RTP Redundancy Update

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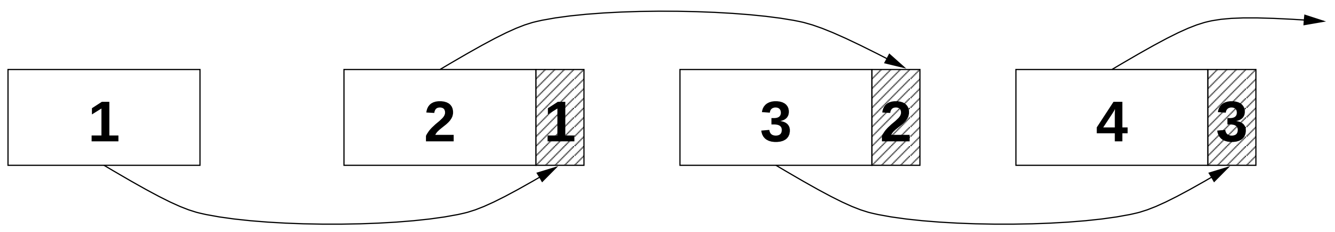
## Status

- RTP redundancy mechanism published as RFC2198 in September 1997.
- Simple packet format, allows bundling of multiple frames of audio into a single packet as a form of media specific FEC.




- Optimised for audio data, but can be used for other media types.

# Example packet

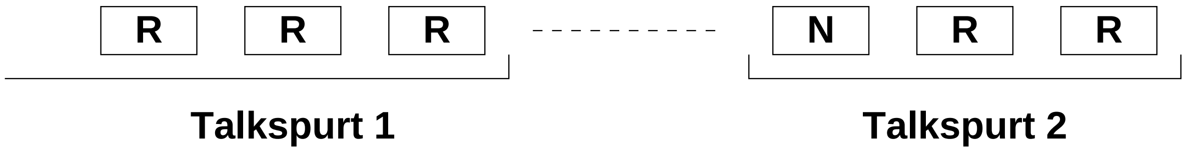
```
 0                   1                   2                   3
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|V=2|P|X|  CC   |M|     PT      |   sequence number of primary  |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|              timestamp  of primary encoding                   |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|           synchronization source (SSRC) identifier            |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|1| block PT=7  |  timestamp offset         |   block length    |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|0| block PT=5  |                                               |
+-+-+-+-+-+-+-+-+                                               +
|                                                               |
+                LPC encoded redundant data                     +
|                                                               |
+                               +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                               |                               |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+                               +
|                                                               |
+                                                               +
|                DVI4 encoded primary data                      |
+                                                               +
|                                                               |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

## Problem: Start of Talkspurt

- The redundant (FEC) data is typically piggy-backed one packet after the primary.
- The first packet in a talkspurt cannot contain FEC data, since there are no preceeding packets.
- This causes two problems:
    1. Changing payload type
    2. Unknown buffering requirement

# Issues: Payload Type

- In a standard RTP session, all packets sent by a source will have the same payload type.
- However, senders using redundant audio send the first packet in a talkspurt with no FEC data (ie: payload type of the primary codec) and the following packets with the redundancy payload type.




- This makes implementations needlessly complex, since they have to associate packets with different payload types into a single stream.

# Issues: Buffer Space

- The FEC data can be sent any number of packets after the primary. This delay isn't known until a packet containing FEC data is received...
- ...by which time the playout buffer length for this talkspurt has already been calculated.
- Adapting the playout buffer mid-talkspurt will cause an glitch in the audio. Not adapting may make it impossible to use the FEC data (since it arrives too late)

# Solution

- Send *all* packet with the redundancy payload type.
- For those at the start of the talkspurt, advertise the FEC offset and set the block length to zero.

```
 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
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|V=2|P|X|  CC   |M|     PT      |  sequence number of primary   |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|              timestamp of primary encoding                   |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|           synchronization source (SSRC) identifier            |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|1|  block PT   |  timestamp offset         | block length = 0  |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|0|  block PT   |                                               |
+-+-+-+-+-+-+-+-+                                               +
|                         ...Media data...                      |
:                                                               :
```

## Solution

- This solves both problems noticed.
- Requires a change to the *usage* of the protocol, but not to the protcol specification itself.
- Believed backwards compatible with existing implementations...