RTP Profile for TCP Friendly Rate Control

draft-ietf-avt-tfrc-profile-03.txt

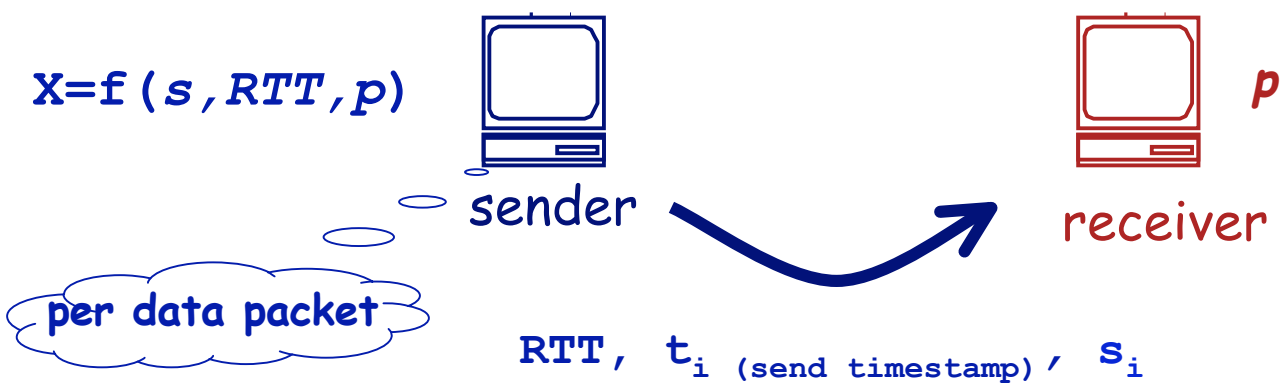
Ladan Gharai (ladan@isi.edu) ……USC Information Sciences Institute

November 11, 2004

61 IETF Washington DC

Overview

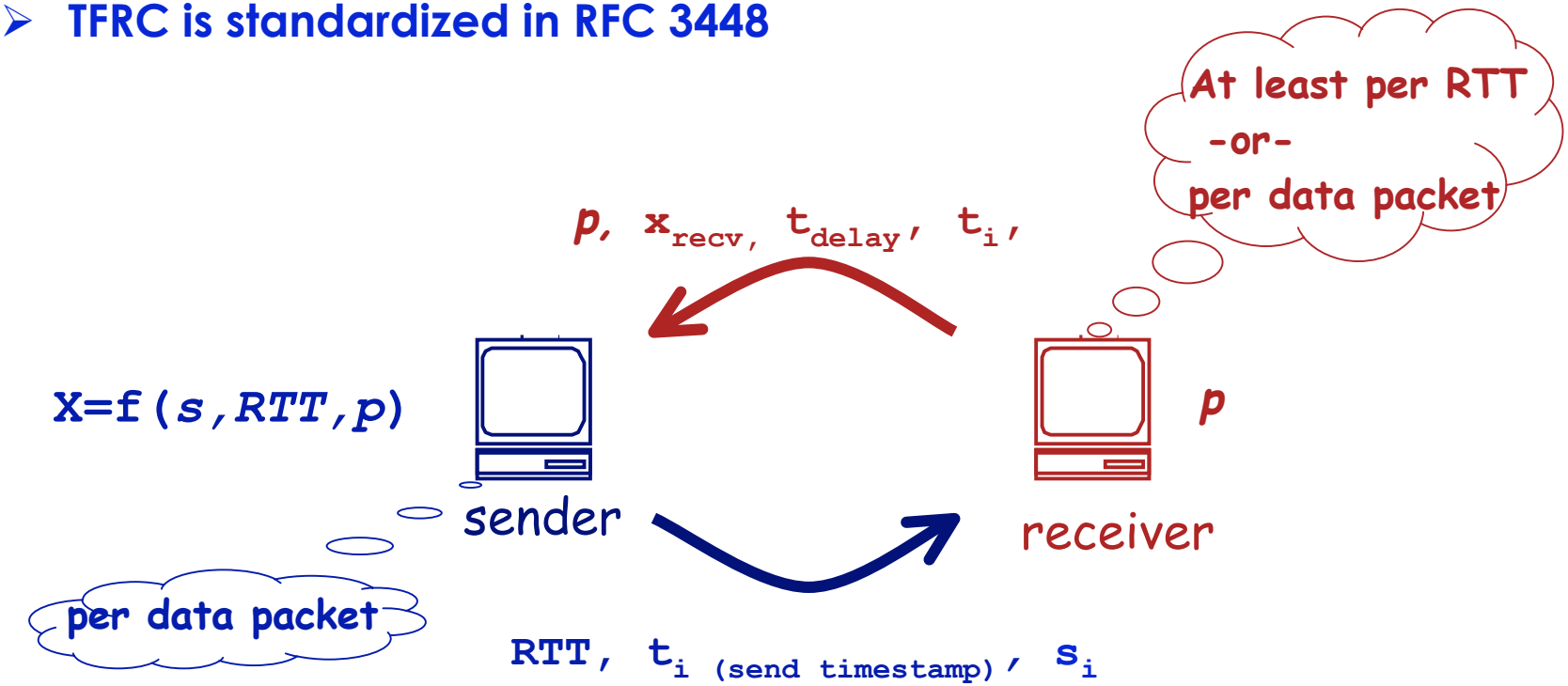
- The RTP Profile for TFRC (AVPCC) specifies use of RTP/RTCP protocols to exchange congestion control information between a TFRC sender and receiver
- TFRC is standardized in RFC 3448



Overview

- The RTP Profile for TFRC (AVPCC) specifies use of RTP/RTCP protocols to exchange congestion control information between a TFRC sender and receiver

- TFRC is standardized in RFC 3448



Changes since -02: The RTP header

- Previously:
  - 16 bit quad-RTT-counter

- Now:
  - 32 bit send timestamps
    - incentive: receiver can do jitter calculations using with the send timestamp
  - 32 bit RTT transmitted in the RTP packet when RTT values change
  - R bit signaling RTT value in RTP packet
    - R bit is taken from the 7 payload value bits

    ⇨ AVPCC uses dynamic payload types and does not share static space with AVP

RTP Header

```
 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 |P|X|   CC  |M|R|     PT     |            sequence#          |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                             timestamp                         |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                              SSRC                             |
+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+
|                        send timestamp                         |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                             CSRC(s)                           |
+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+
```

AVPCC RTP header: R=0 no RTT included

RTP Header

```
 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 |P|X|   CC  |M|R|     PT     |            sequence#          |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                             timestamp                         |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                              SSRC                             |
+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+
|                        send timestamp                         |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                               RTT                             |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                             CSRC(s)                           |
+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+
```

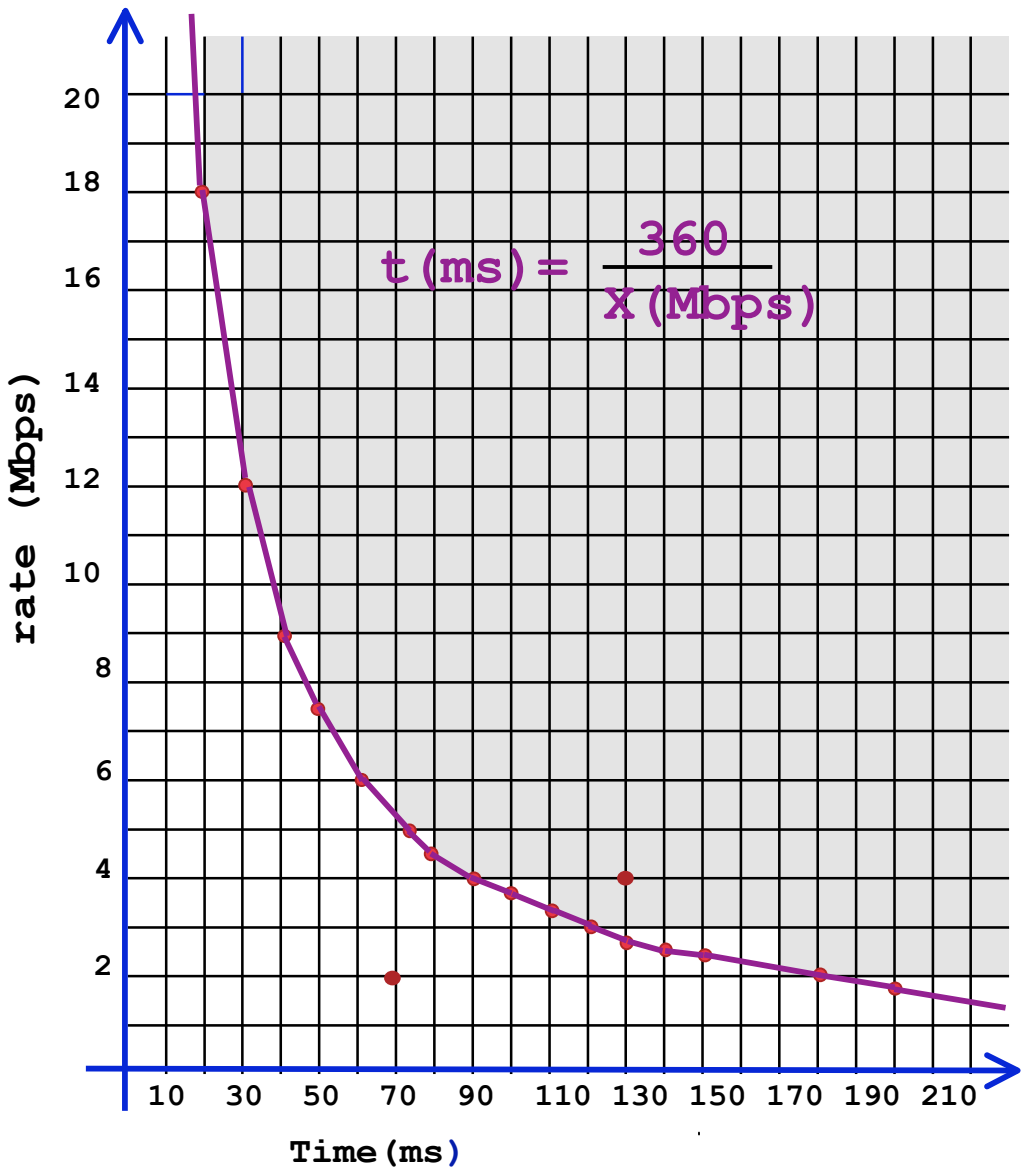
AVPCC RTP header: R=1, RTT included

RTCP: Receiver Report Extensions

```
 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 |P|X|   RC  |   PT=SR=200   |         length                |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                         SSRC of sender                        |
+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+
|                              SSRC_1                           |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
| fraction lost | cumulative number of packets lost             |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|        extended highest sequence number received              |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                         inter arrival jitter                  |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                       last SR (LSR)                           |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                       delay since last SR                     |
+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+
|                            t_i                                |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                            t_delay                            |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                            x_recv                             |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                      loss event rate: p                       |
+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+=+
|    CNAME =1   |  length       |       user name               |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

IP/UDP(28) + RTCP header(8) + RR(24) + extensions(16) + SDES(12) = 88 bytes

RTCP reduced minimum timing interval



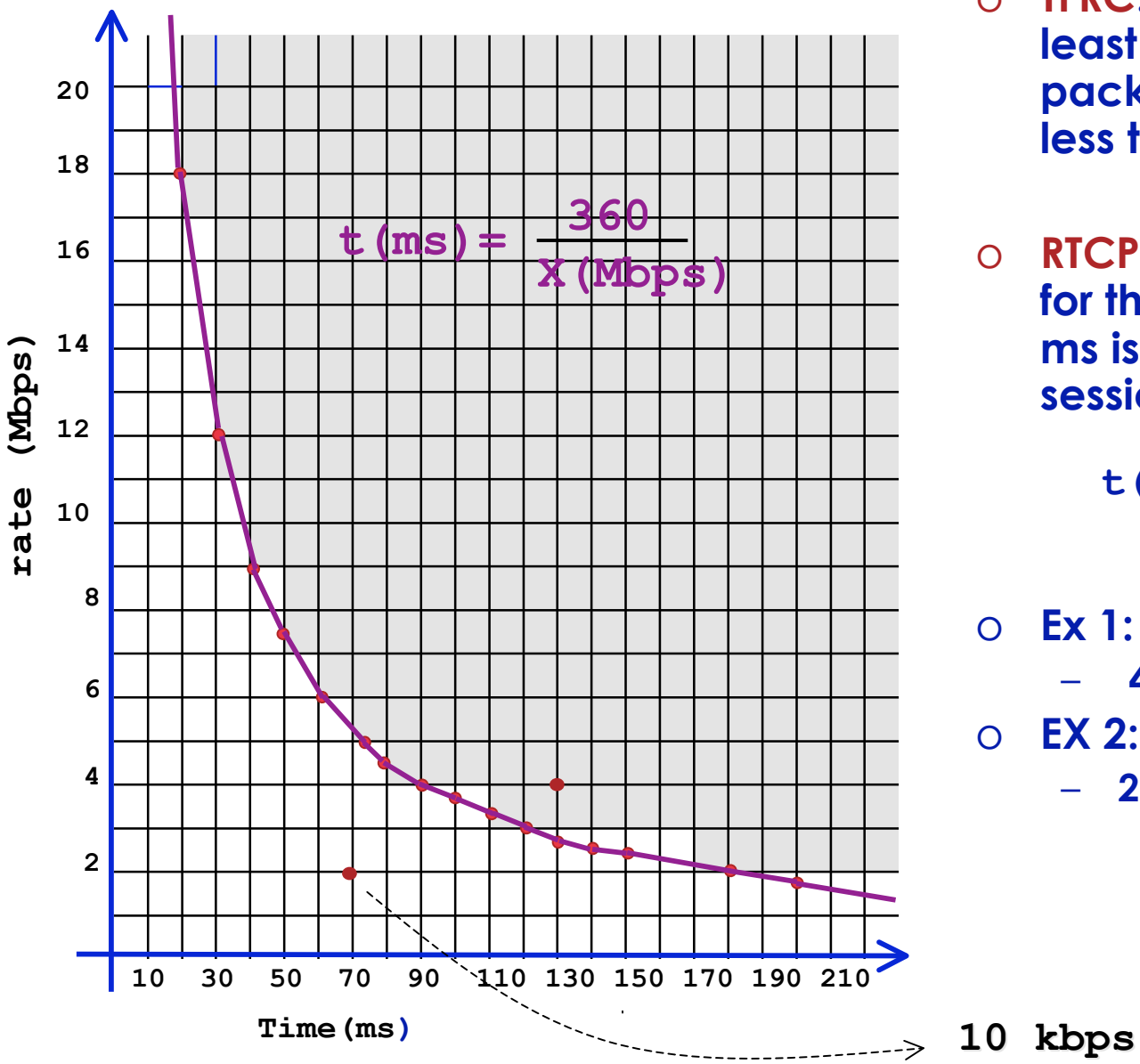
- **TFRC**: send feedback at least once per RTT or per packet (for flows sending less than 1 packet per RTT).

- **RTCP**: RECOMMEND value for the reduced minimum in ms is 360 divided by the session bandwidth in Mbps.

$$t(ms) = \frac{360}{X_{RTP}(Mbps)}$$

- Ex 1:
  - 4 Mbps flow, RTT= 130ms
- EX 2:
  - 2 Mbps flow, RTT= 70ms

RTCP reduced minimum timing interval

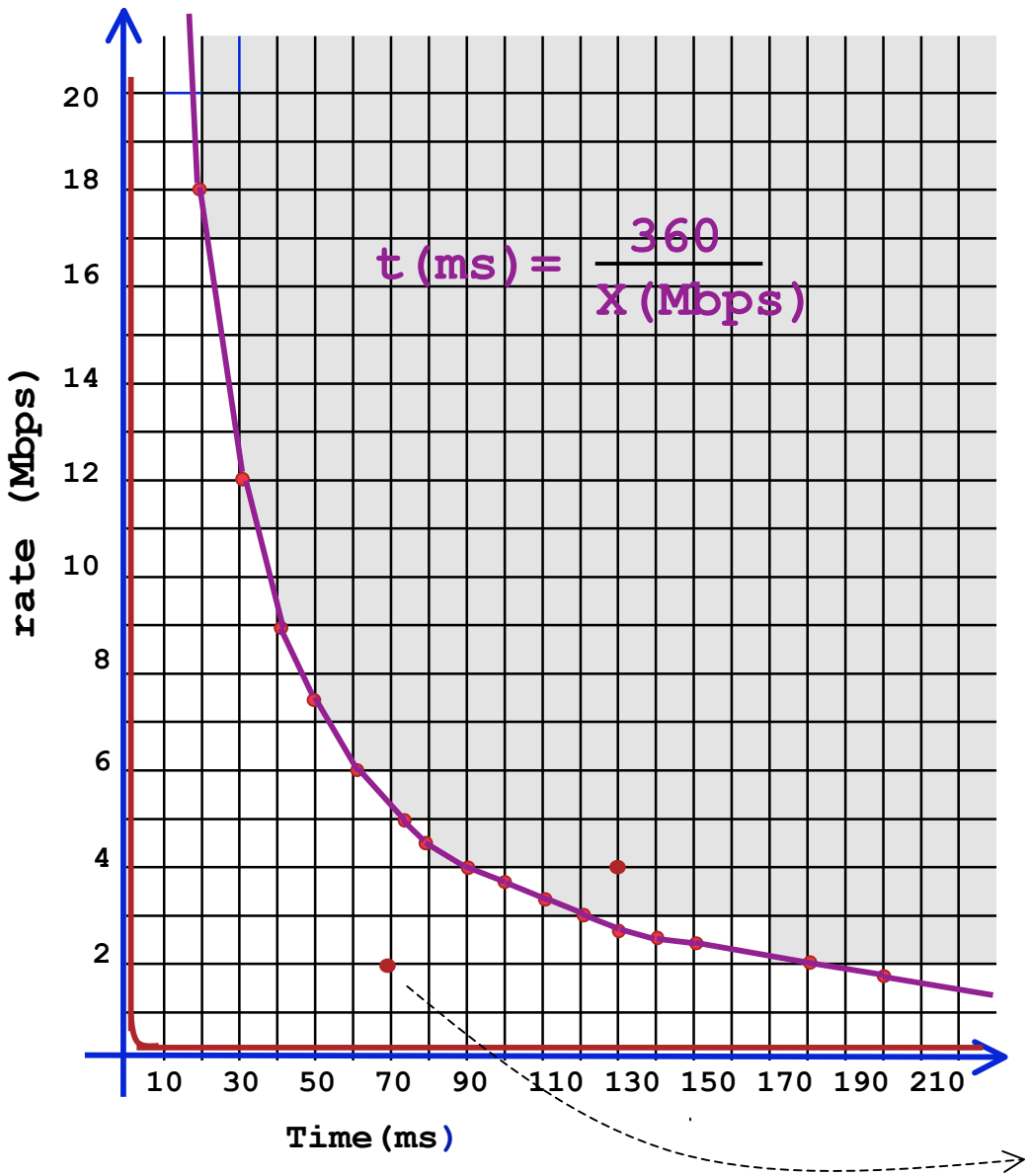


- **TFRC**: send feedback at least once per RTT or per packet (for flows sending less than 1 packet per RTT).
- **RTCP**: RECOMMEND value for the reduced minimum in ms is 360 divided by the session bandwidth in Mbps.

$$t(ms) = \frac{360}{X_{RTP}(Mbps)}$$

- Ex 1:
  - 4 Mbps flow, RTT= 130ms
- EX 2:
  - 2 Mbps flow, RTT= 70ms

RTCP reduced minimum timing interval



- **TFRC**: send feedback at least once per RTT or per packet (for flows sending less than 1 packet per RTT).

- **RTCP**: RECOMMEND value for the reduced minimum in ms is 360 divided by the session bandwidth in Mbps.

$$t(ms) = \frac{360}{X_{RTP}(Mbps)}$$

- **RTCP**: "It is recommended that the fraction of session bandwidth added for RTCP be fixed at 5%"

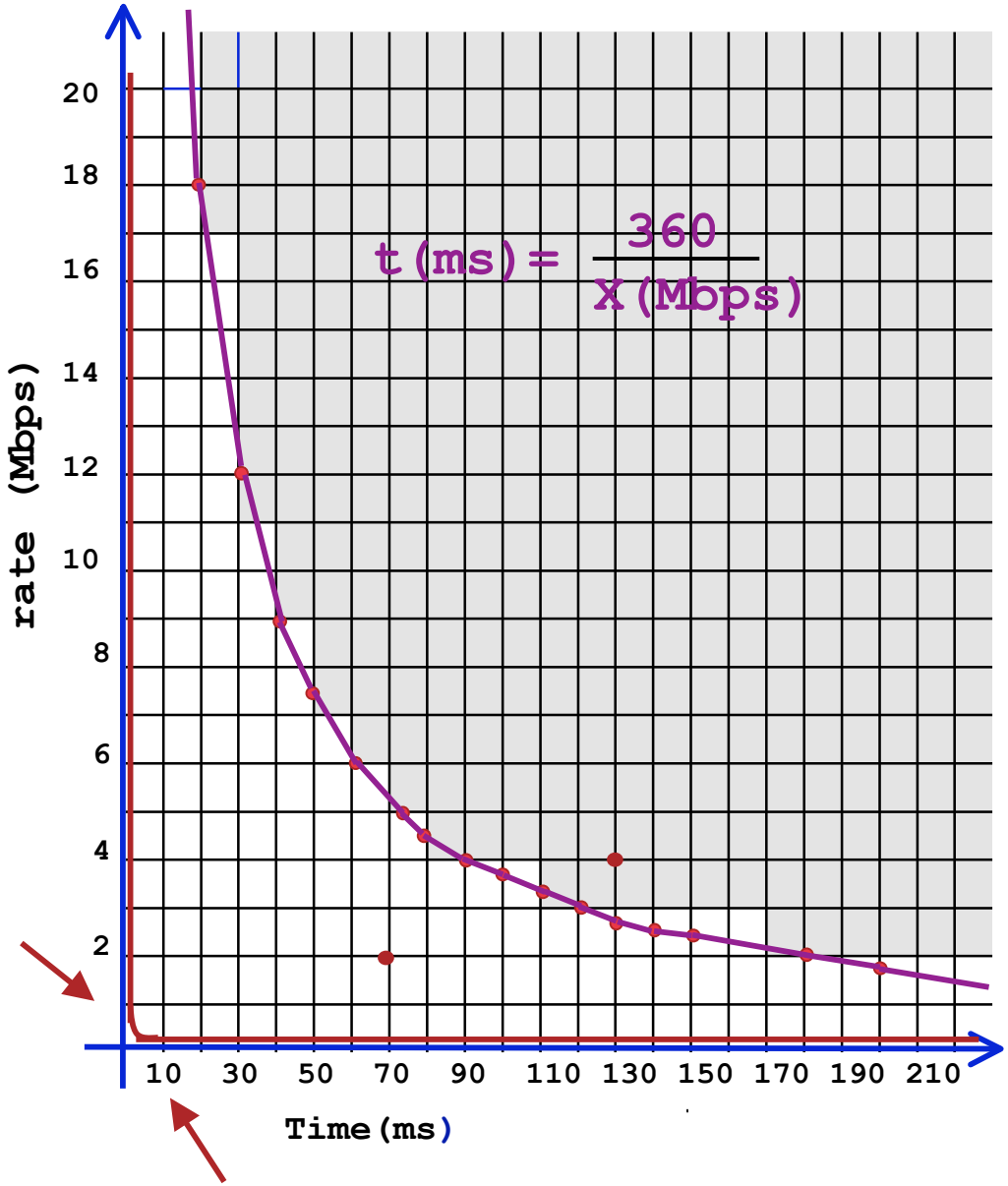
$$X_{RTCP}(Mbps) = \frac{0.704}{RTT}$$

RTCP reduced minimum timing interval

- Discussion and recommendations on the RTCP timing intervals:

  “The RTP/AVPCC profile recommends the use of the TFRC timing feedback requirements for the RTCP timing intervals, only in instances where control traffic bandwidth does not exceed RFC 3550's recommended 5% of data traffic.”

RTCP reduced minimum timing interval



- Assuming 88byte RTCP packets, certain flows cannot abide by both the RTCP %5 restriction and TFRC's feedback timing requirements in particular: flows < 1Mbps and with RTT <10 ms

Security

- Adopt the Secure Real-time Transport Protocol, RFC 3711, SRTP profile for security
  - Applications not requiring security - use the NULL algorithm as described in RFC 3711

Open Issues

- RTCP feedback bandwidth:
  - Should feedback be restricted to 5% of the session bandwidth?
  - AVPCC is a unicast protocol

- RTT calculations:
  - Use LSR and DLSR in the SR for RTT calculations?
  - For interactive traffic two-way traffic the RTT does not need to be included in the RTP packets?

- Should the draft include more introductory text on TFRC?