RTP Profile for TCP Friendly Rate Control

draft-gharai-avt-tfrc-profile-00.txt

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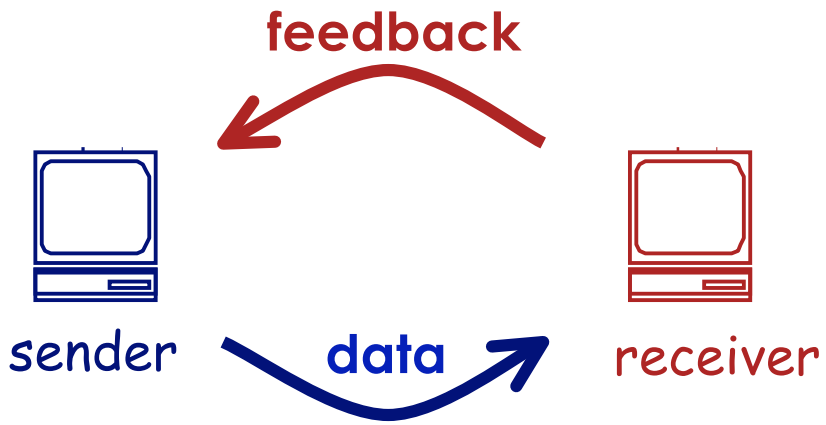
Outline

- TFRC Basics
- RTP Profile for TCP Friendly Rate Control
- Relation to DCCP?
- Open Issues

TCP Friendly Rate Control

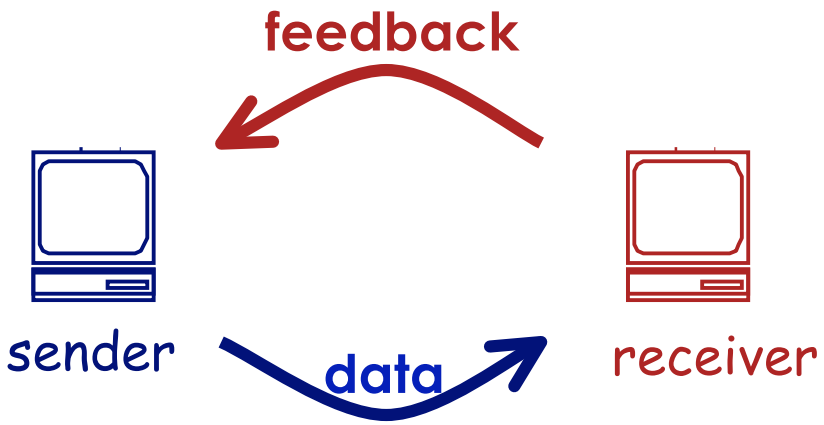
- **TFRC is a equation based congestion control scheme**
  - RFC 3448
  - Unicast flows only
  - Fair to TCP on average
  - Slowly changing rate suitable for streaming media applications



X = F (feedback, sender info)

The TCP Throughput Equation

- Any equation that computes TCP throughput as a function of:
  - Loss event rate: ***p***
  - Round trip time: **RTT**
- **packet size: s**

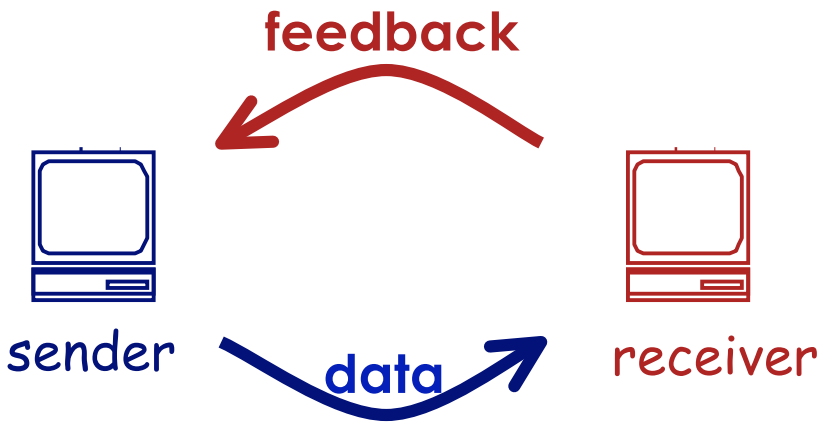


$$X = \frac{s}{RTT\sqrt{\frac{2p}{3}} + \left(4RTT\left(3\sqrt{\frac{3p}{8}}\right)p\left(1+32p^2\right)\right)}$$

Feedback Loop (per RFC 3448)

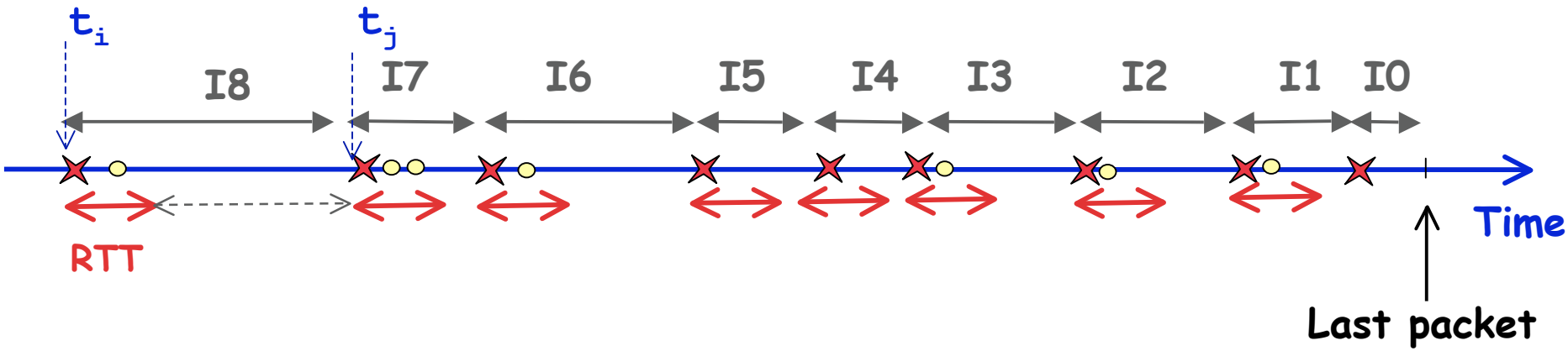
- **Data Packets:**
  - sequence number s_i
  - transmission timestamp t_i(ms)
  - sender's estimate of RTT (counter incremented 4/RTT)

- **Feedback Packets:**
  - timestamp last packet received t_i (optional)
  - t_{delay}
  - perceived receiver rate, x_{recv}
  - loss event rate p



Loss event rate: *p*

Loss event: $t_j > RTT + t_i$



Loss event: packet loss, after one RTT

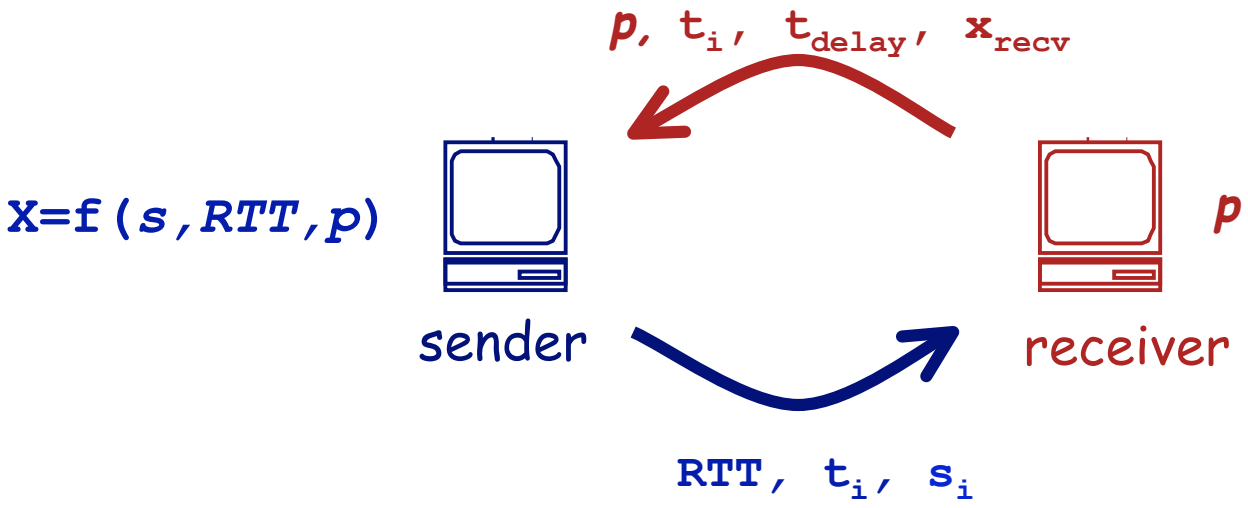
Packet loss, within one RTT

RTT

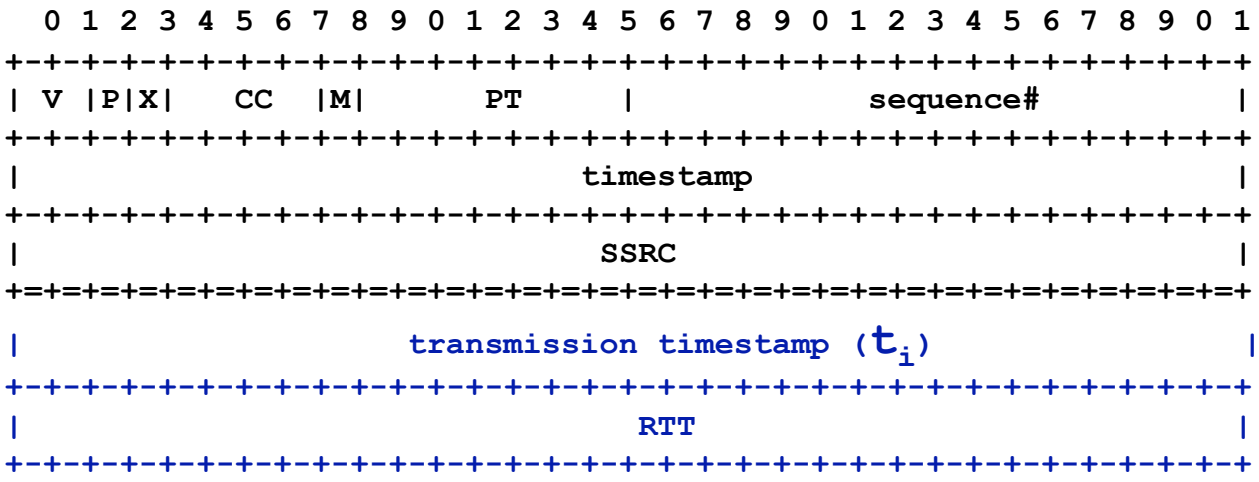
TFRC Loss Intervals

RTP Profile for TCP Friendly Rate Control

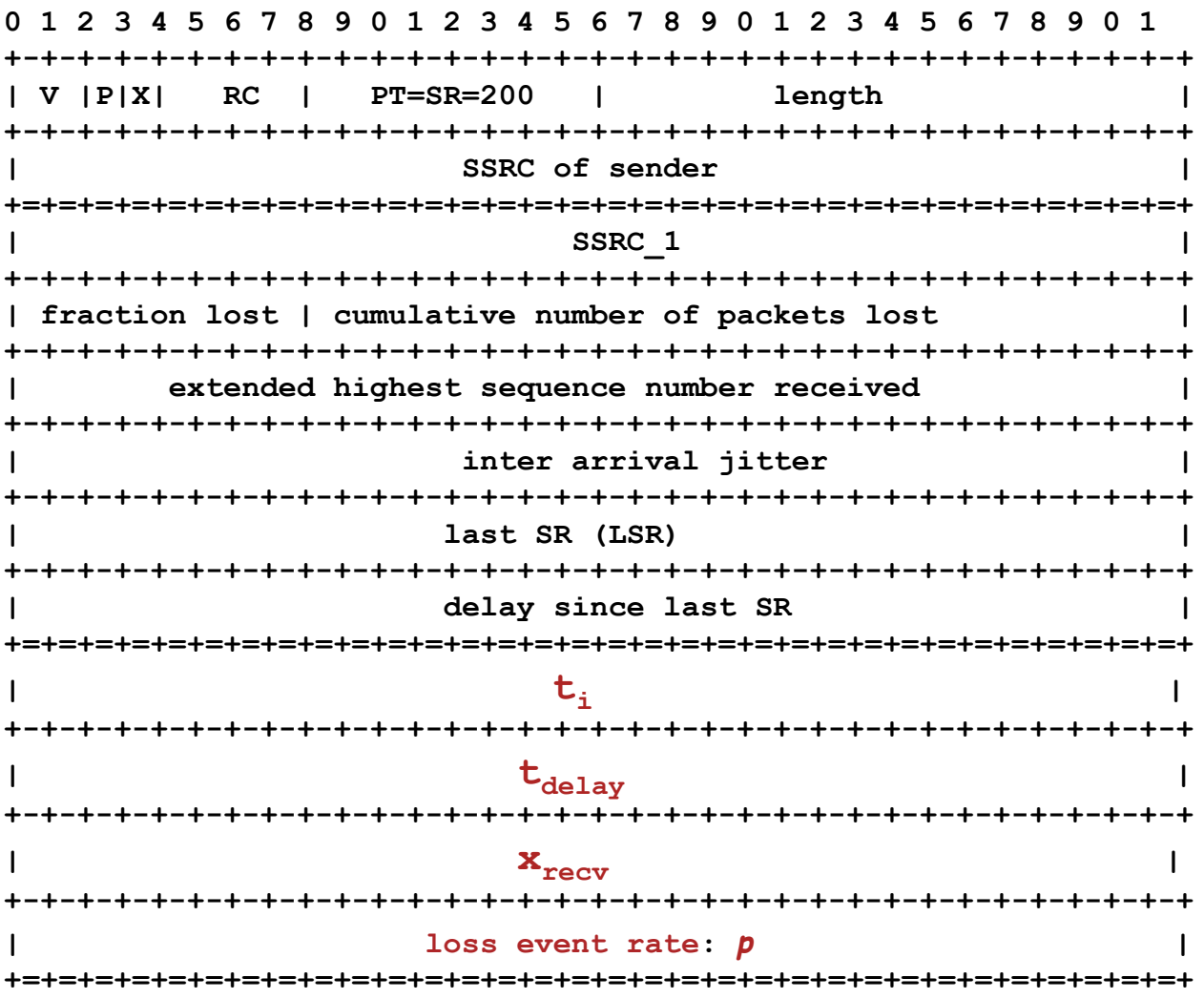
- **Using RTP/RTCP to support TFRC**
  - Providing feedback in a timely manner:
    - receiver -> sender
    - sender -> receiver



RTP Data Header Additions

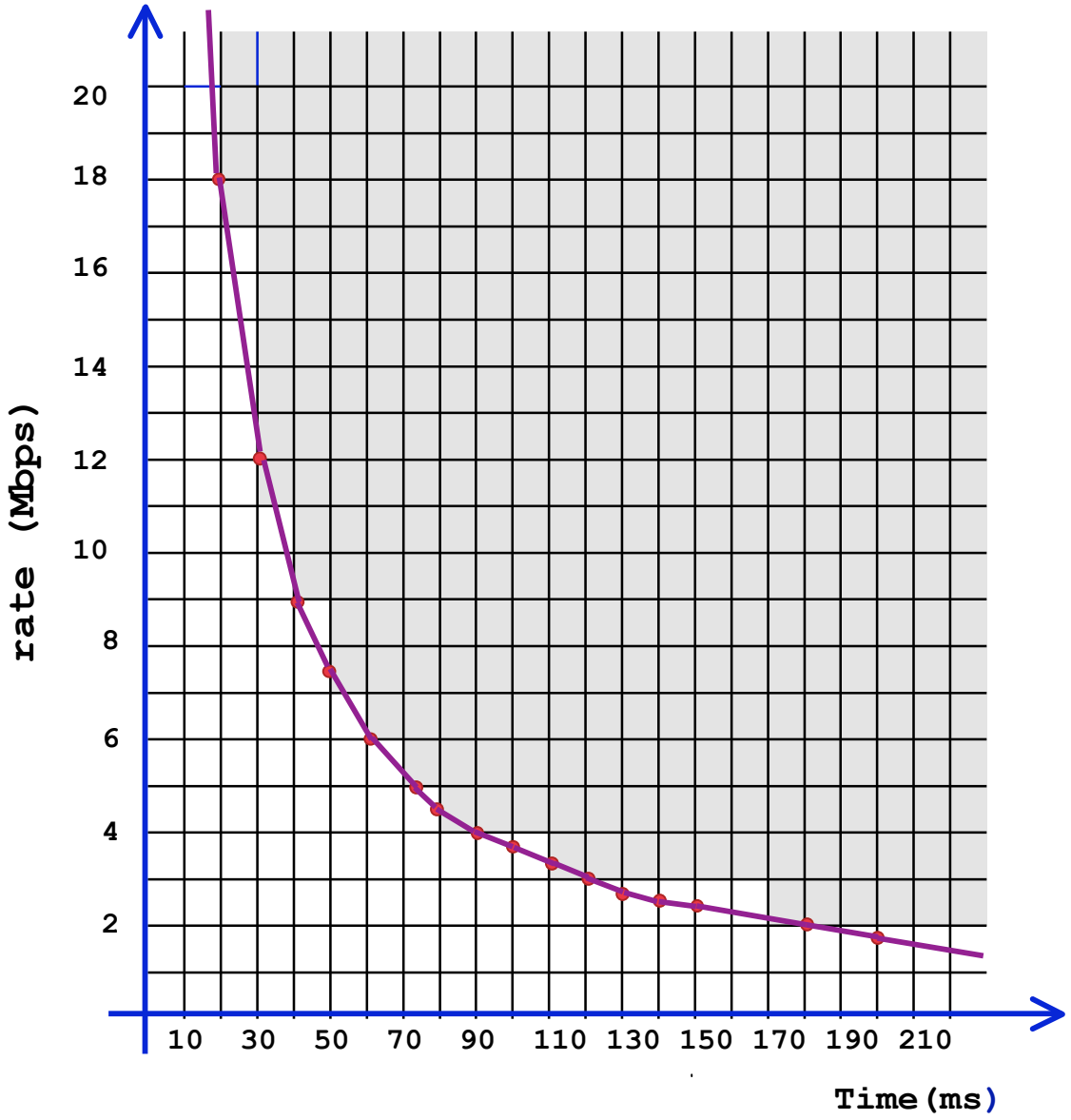


Receiver Report Extension



IP + UDP + RR + extensions + SDES = 88 bytes

RTCP Timing Intervals



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

RTT (ms)	RTCP bandwidth (kbps)
10	70.4
25	28.16
50	14.08
70	10.06
100	7.04
150	4.6
200	3.5

Relation to DCCP?

- **DCCP in addition to "plug-in" congestion control provides a host of services and features to applications:**
  - use of ECN
  - Data Dropped option
  - reliable connection and option negotiation
  - support for mobility and multihoming
  - ...
- **The RTP profile for TFRC provides an interim solution until DCCP is deployed**

- **Quickly deployable**
  - does not require OS level changes
  - does not require NAT/firewall changes

Open Issues

- **AVT working group item?**
- **Is this useful?**

- **Technical points:**
  - Alternative approaches?
    - i.e: sender compute loss event rate?
  - RCTP restrictions?
    - minimum intervals
    - size of compound packets