UPDATES ON SCReAM

draft-johansson-rmcat-scream-cc-05

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AGENDA

Overview on updates since IETF 91 meeting

SCReAM opensource code

Recap of development on SCReAM

Call for adoption

CHANGES IN THE DRAFT

Changes to reflect the comments and discussions from IETF91

Removed framework

Details on SCReAM sender and SCReAM receiver

Simplified equations to improve readability

Added additional features

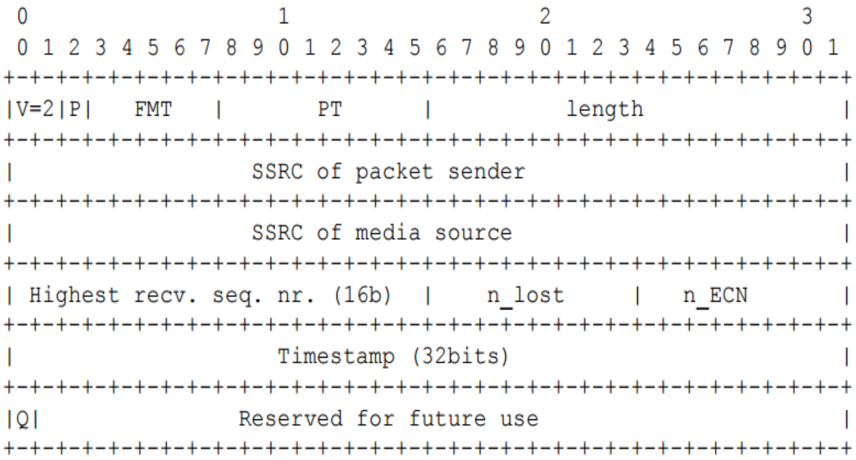
- Frame skipping moved to additional features

Updated open issues list

- Use of ‘Q’ described – description of rate distribution among multiple RTP streams
- Use of ECN fields in the feedback message described.

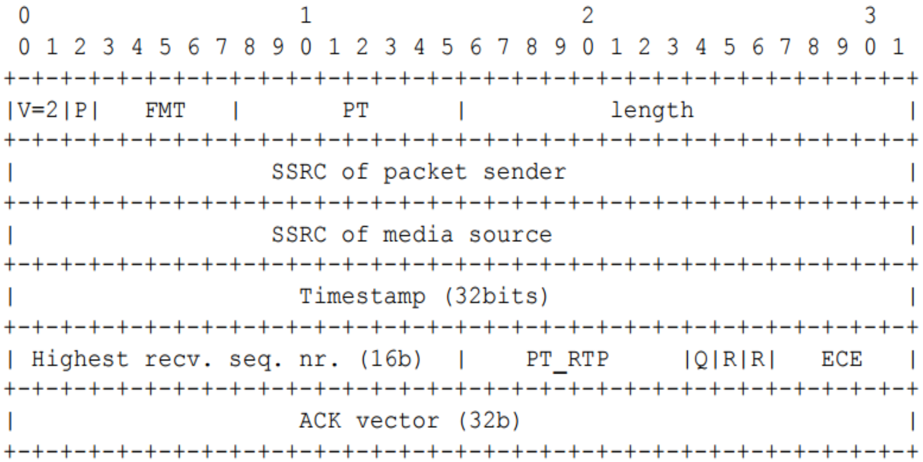
CHANGES IN THE ALGORITHM (1/2)

- RTCP feedback message
  - *ACK vector* replaced by loss counter(*n_loss*)
  - Removed ECN echo (*ECE*), added *n_ECN*
  - Removed *PT_RTP*



```
 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|   FMT   |       PT      |          length               |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                  SSRC of packet sender                        |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                  SSRC of media source                         |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
| Highest recv. seq. nr. (16b) |     n_lost    |     n_ECN      |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                    Timestamp (32bits)                         |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|Q|                 Reserved for future use                     |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

Feedback message -05



```
 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|   FMT   |       PT      |          length               |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                  SSRC of packet sender                        |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                  SSRC of media source                         |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                    Timestamp (32bits)                         |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
| Highest recv. seq. nr. (16b) |    PT_RTP    |Q|R|R|    ECE    |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                    ACK vector (32b)                           |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

Feedback message -04

CHANGES IN THE ALGORITHM (2/2)

Competing flows compensation

- Frame blanking and *owd* estimation during frame blank removed
- *owd_target* allowed to increase if variance and skew of normalized *owd* remains below thresholds

Fairness enforcement

- Fairness is achieved implicitly in algorithm, by resumed fast start.
- Still good results in e.g. competing RTMCAT flows and RTT fairness test cases

Resume fast start

- Fast start can resume if no congestion is detected i.e. *owd_trend* is low.
- Gives better fairness and increased robustness against competing TCP flows

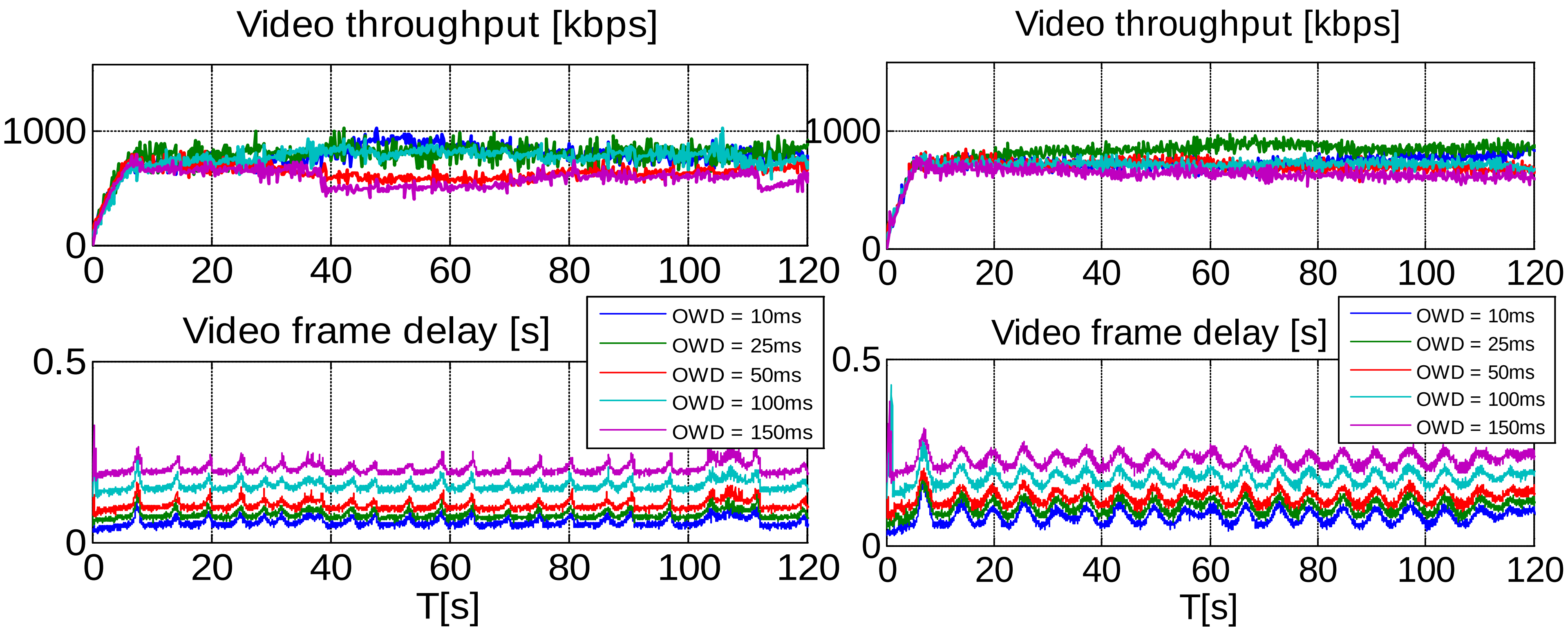
Video rate control

- Both RateTx and RateACK is used
- Removed coupling to frame skipping
- Rate change based on RTP queue delay removed

For ease of understanding look at the C++ code (ScreamTx.cpp and ScreamRx.cpp) along with the draft

RTT FAIRNESS

More waves of jitter but more fairness in throughput

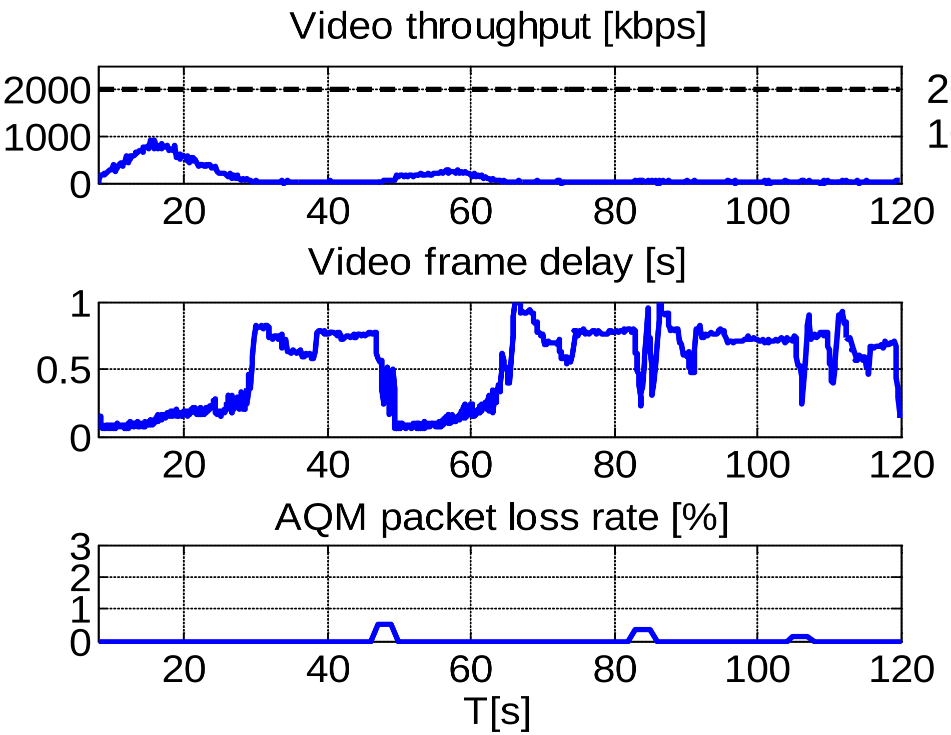


SCReAM -03

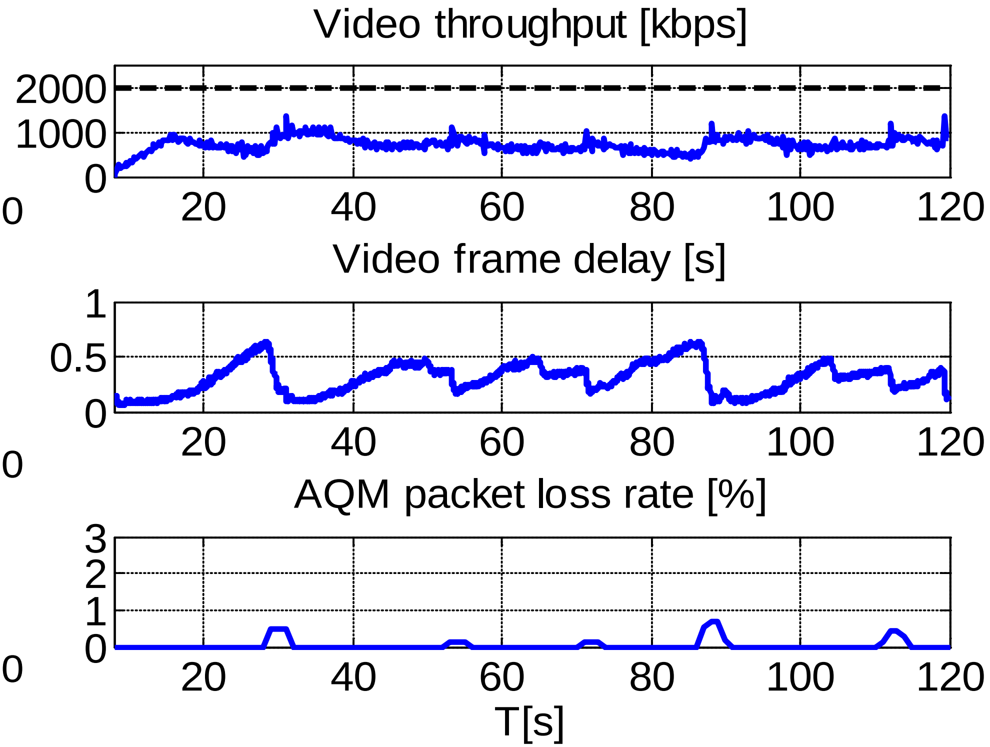
SCReAM -05

COMPETING TCP TRAFFIC
(DROP TAIL 300MS)

Higher throughput and lower delay at the cost of slightly higher packet loss



SCReAM-03



SCReAM-05

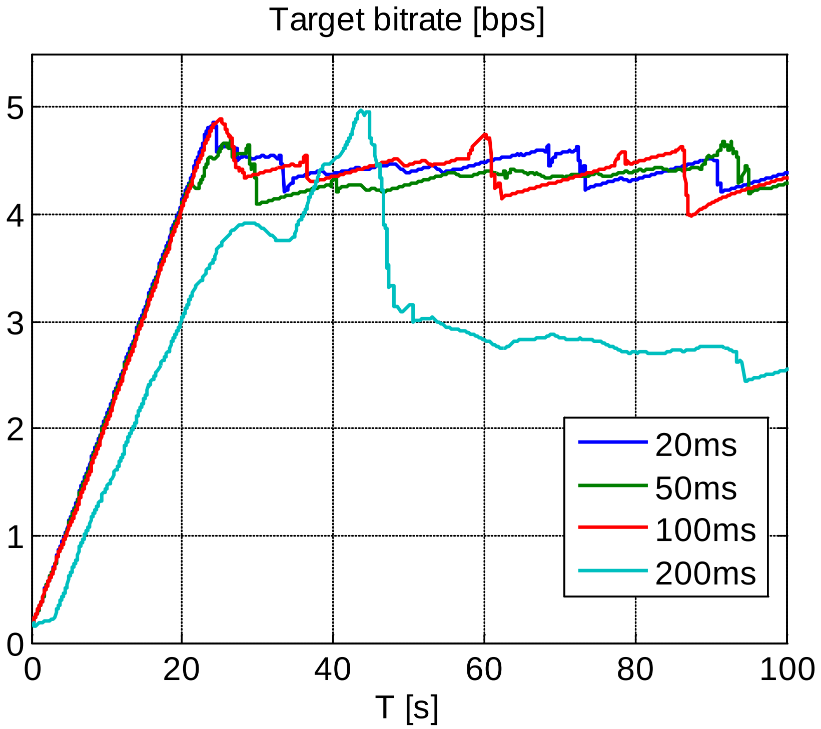
SENSITIVITY TO RTCP FEEDBACK RATE

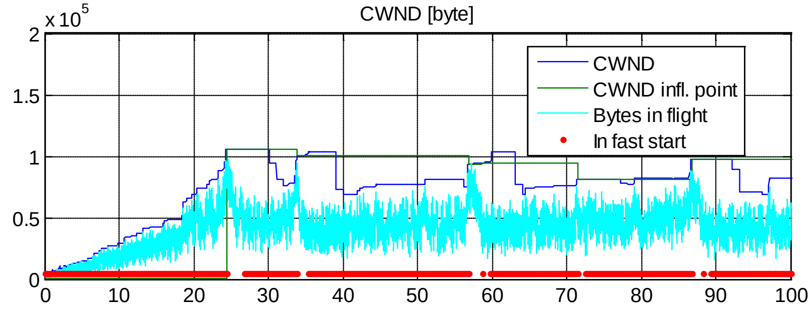
RTCP feedback every RTP packet is not necessary !

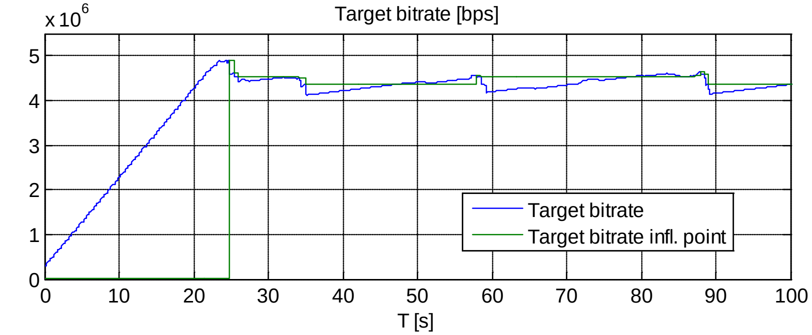
- CWND gives a send headroom with rate limited sources
- Packet pacing

Very rough recommended RTCP intervals

- 100kbps → ~200ms
- 1.5Mbps → ~50ms
- 10Mbps → ~20ms

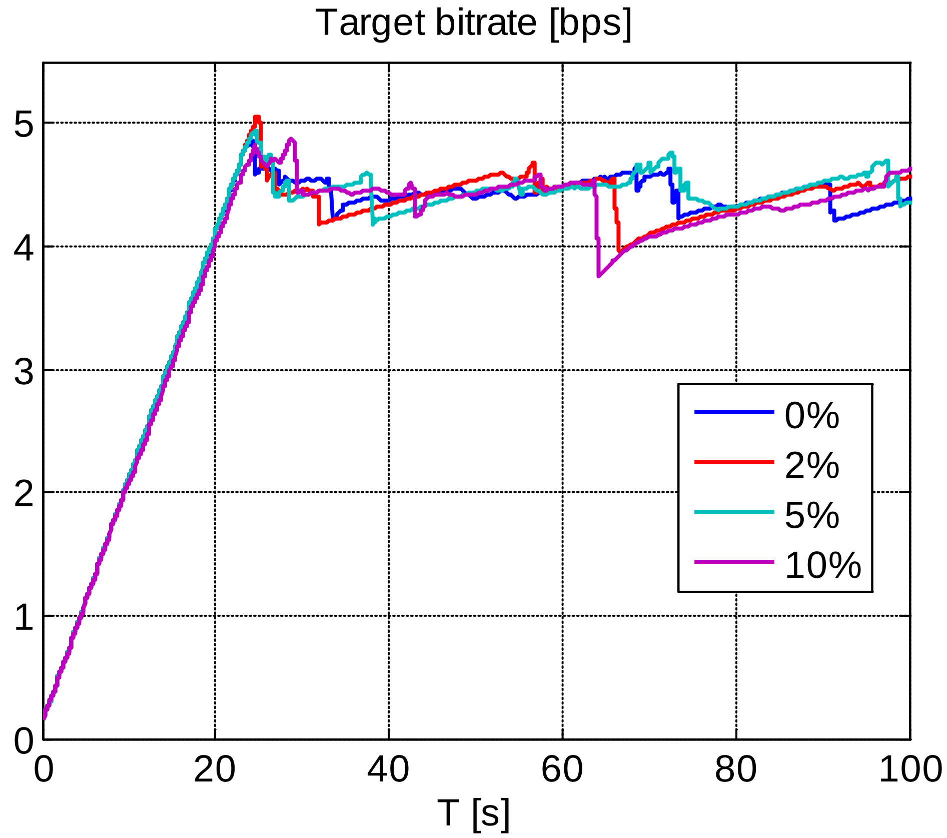






SENSITIVITY TO LOST RTCP FEEDBACK

- RTCP interval 20ms
- Low sensitivity to lost RTCP feedback as long as RTCP interval is reasonably short



SCREAM OPEN SOURCE CODE

Ericsson Research Open sourced the SCReAM code

- Clone it from https://github.com/EricssonResearch/scream
- Grab the how to from https://github.com/EricssonResearch/scream/blob/master/SCReAM-description.pdf
- Get involved and make it even better… ☺
- An integration with OpenWebRTC is on going

Things to be noted

- The code is experimental
- Contains code to do quick experiments
- Does not contain RTP or RTCP functionalities or full RTP packet queue implementation
- Simple networking functionalities (delay, jitter, rate limit)

SCReAM CLASSES

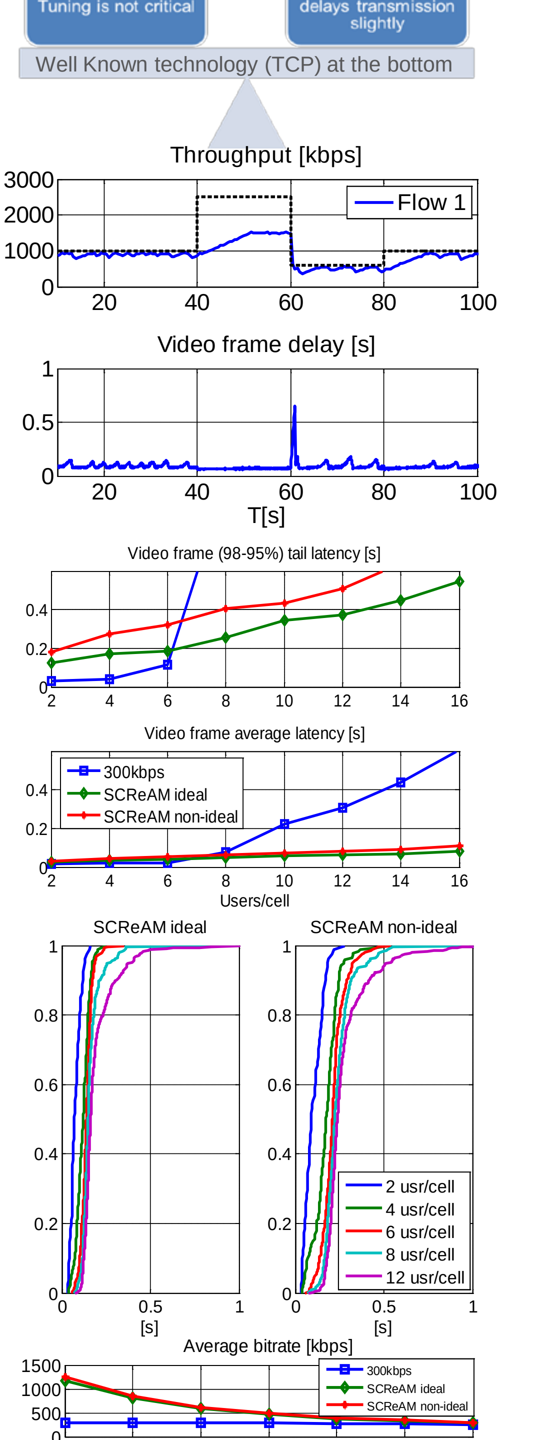
Main SCReAM algorithm:	ScreamTx : SCReAM sender algorithm	Implements SCReAM congestion control algorithm on sender side
		Contains parameters which can be tuned for experimental purpose
	ScreamRx : SCReAM receiver algorithm	Implements SCReAM receiver side functionality and generates RTCP feedback elements

Support classes for experiment:	RtpQueue : Rudimentary RTP queue	Need to be replaced if the ScreamTx in ported to other platforms
	VideoEnc : Simple model of Video encoder	
	NetQueue : Simple delay and bandwidth limitation	Only to be used for simulation purpose

SO FAR ON SCReAM

SCReAM

- Is a robust and efficient rate adaptation algorithm
- Built upon well known technologies and principles
- Is tested for basic test cases
- Is the only one tested for radio environment
- Has running code (open sourced)
- Draft has matured over time
- OpenWebRTC integration ongoing



Tuning is not critical

delays transmission slightly

Well Known technology (TCP) at the bottom

SCReAM

Adopt as WG item??

ERICSSON