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SCReAM-03 updates and evaluation

draft-johansson-rmcat-scream-cc-03

Zaheduzzaman Sarker

Ericsson Research

AGENDA

- Updates on SCReAM
- Basic test cases evaluation results
- Cellular test cases evaluation results

ADDITIONS AND CHANGES

Additions

OWD trend

- Product of 1st order OWD prediction and OWD fraction
- Gives an earlier warning of congestion → Less risk of jitter spikes

Target rate increases slowly when :

- OWD trend is high
- Target rate is close to last known congested bitrate (inflection point)

Changes

More descriptive

Removed pseudo code

BASIC TEST CASES EVALUATION

INTRODUCTION

Tests done according to draft-ietf-rmcat-eval-test-00

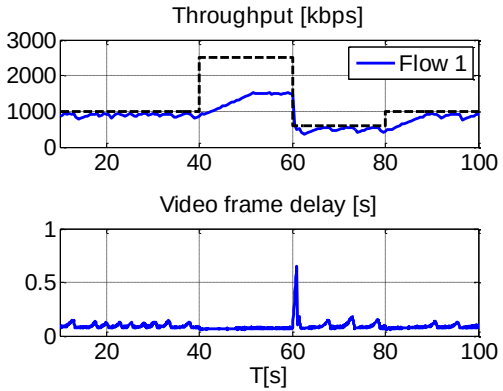
Presented results have

- One way propagation delay = 50ms

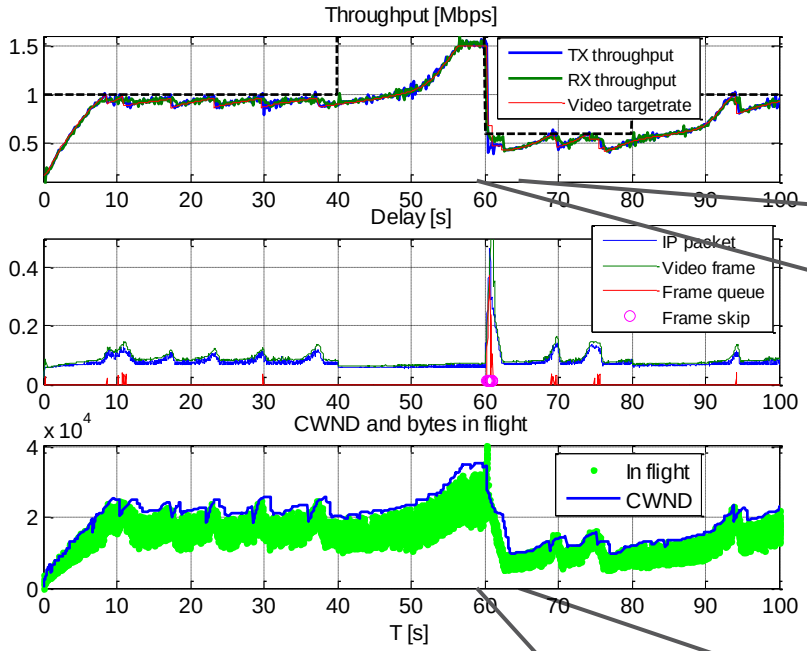
Algorithm

- **S**elf-**C**locked **R**at**e** **A**daptation for **M**ultimedia (SCReAM)
  - draft-johansson-rmcat-scream-cc-03
    - Video codec frame skipping enabled (threshold 100ms)
    - Frame blanking disabled
    - Competing flow adjustment disabled

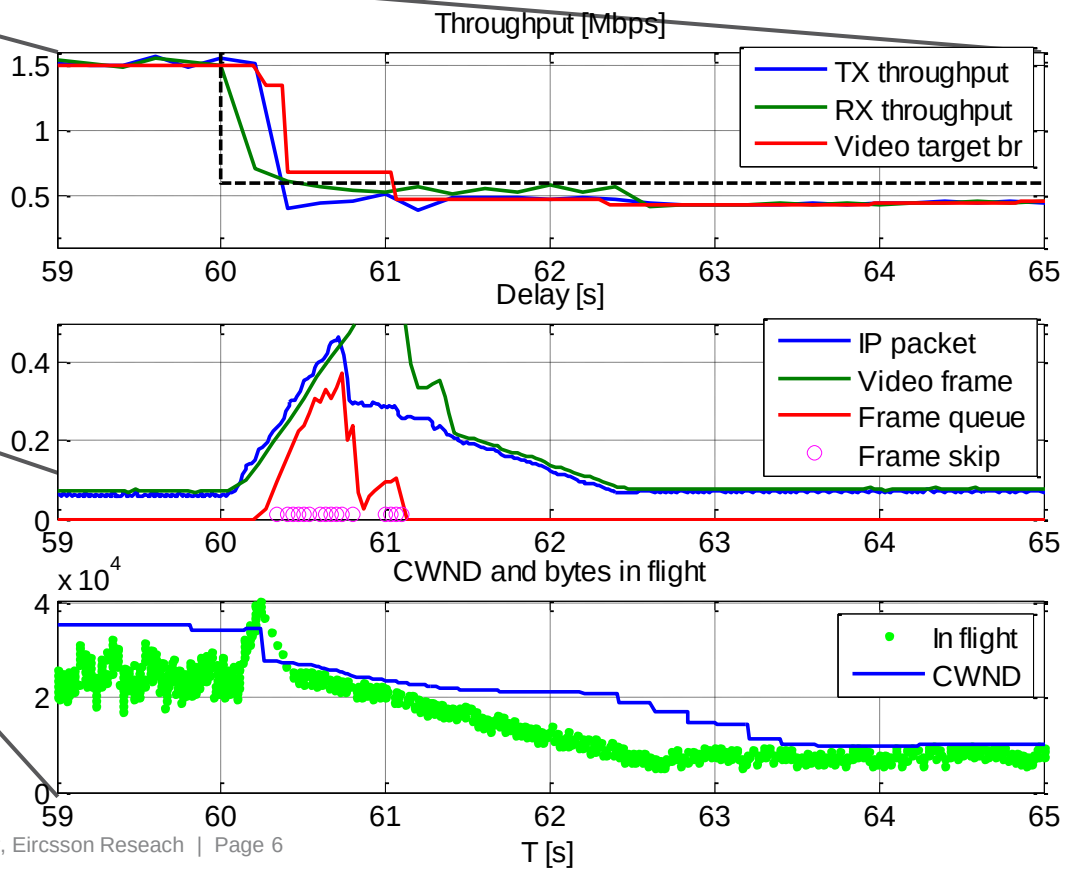
VARIABLE BW SINGLE FLOWS (DROP TAIL 300MS)



SCReAM -02

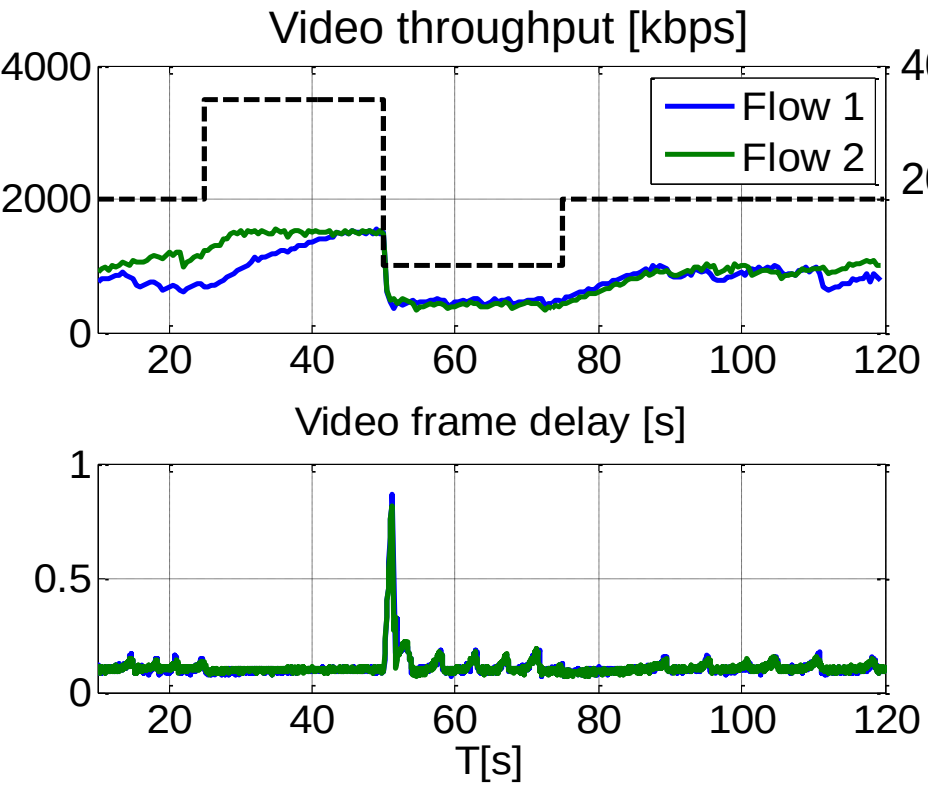


SCReAM -03

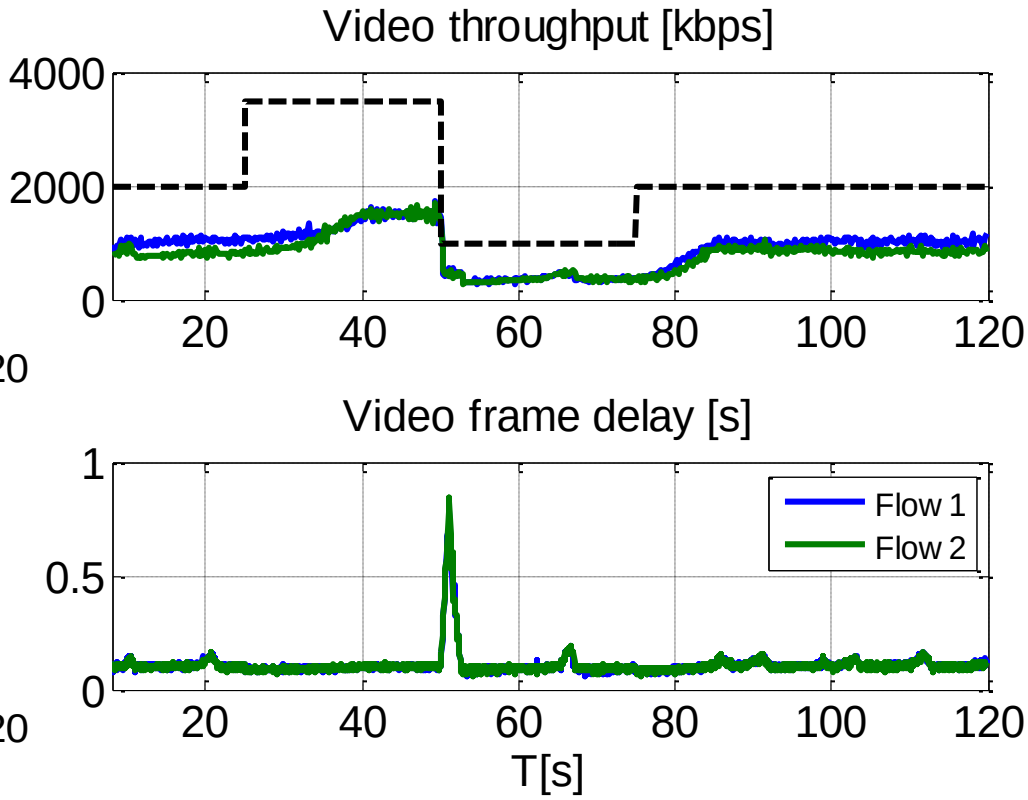


VARIABLE BW MULTIPLE FLOWS (DROP TAIL 300MS)

More fair, stable and less jitter.



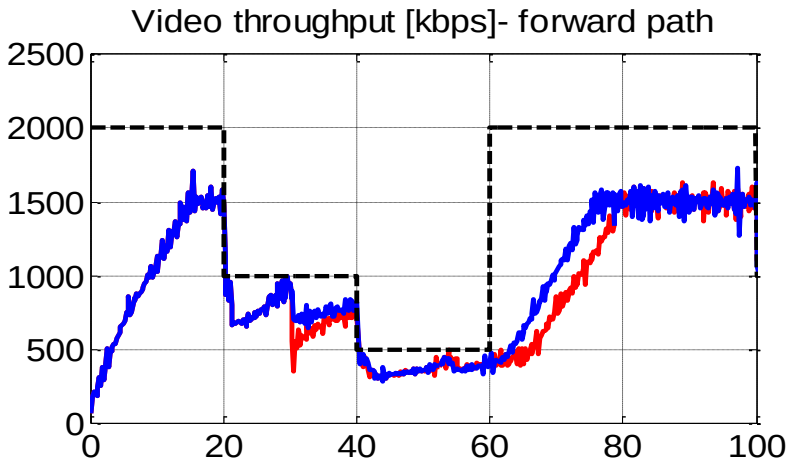
SCReAM-02

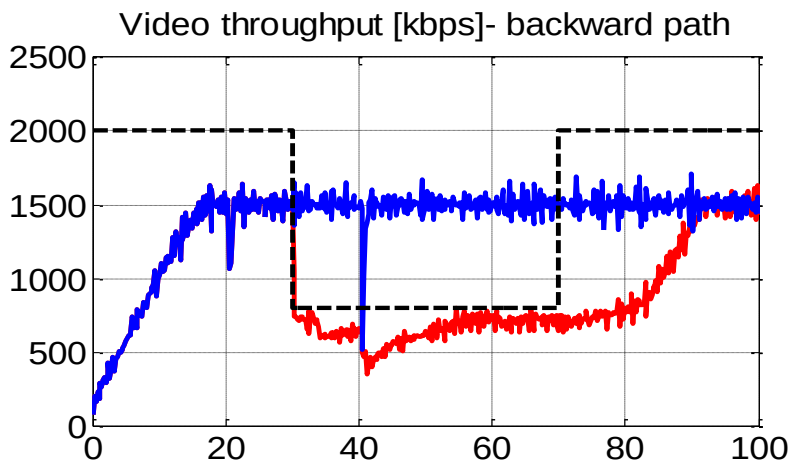


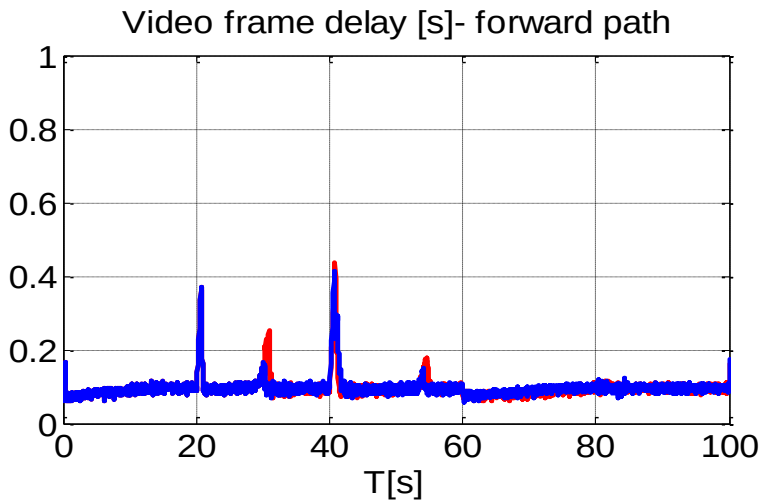
SCReAM-03

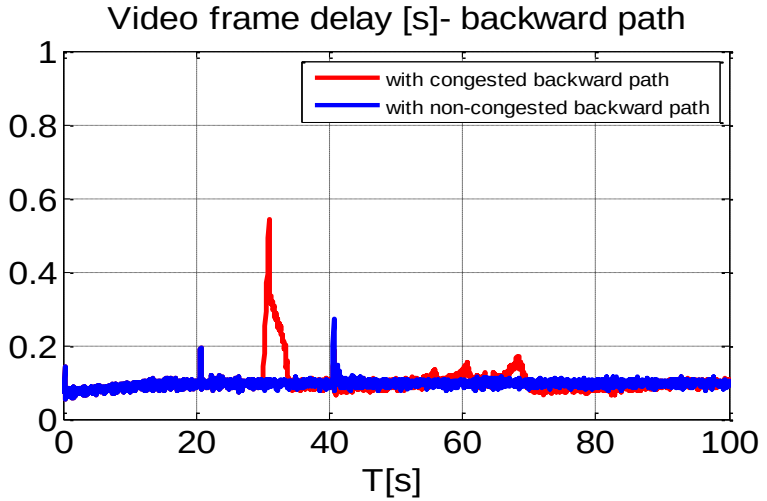
CONGESTED FEEDBACK LINK

SCReAM maximizes the bandwidth utilization on both of the paths and as expected sensitive to the delayed and lost feedback.



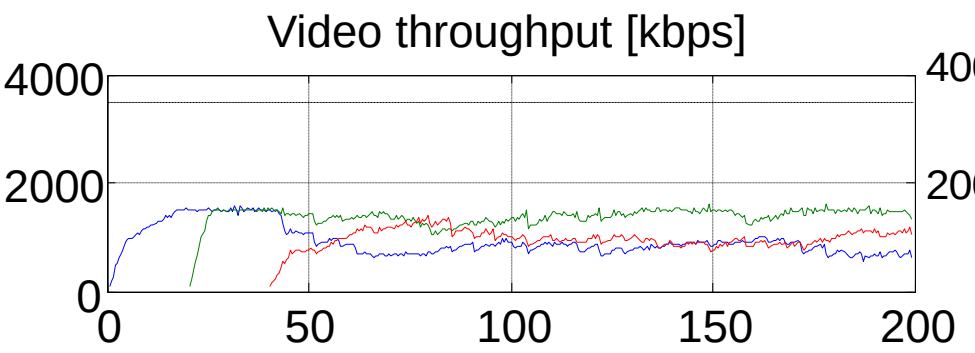


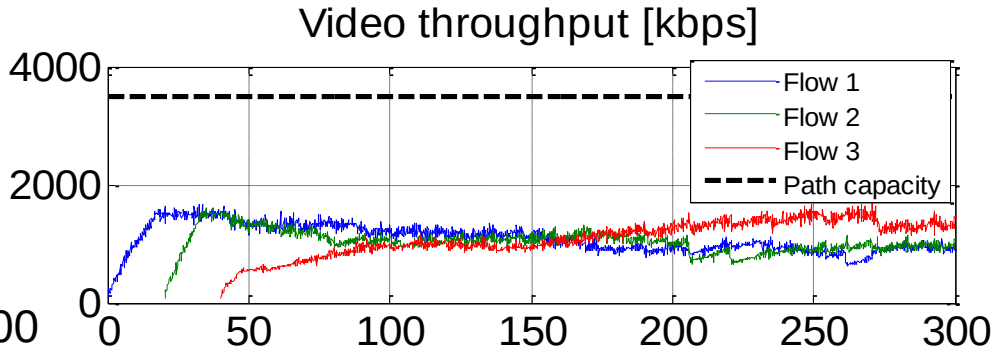


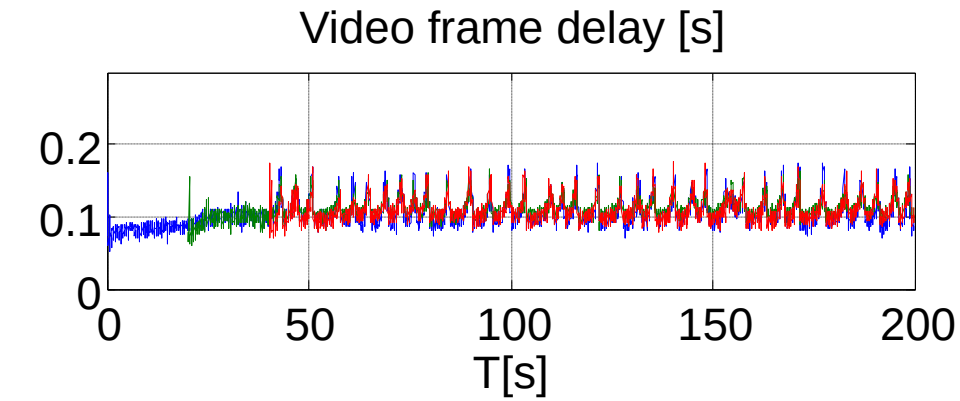


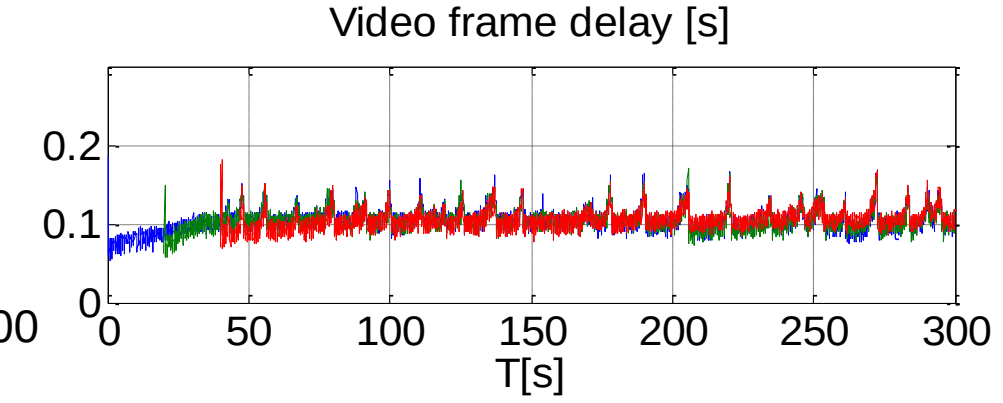
COMPETING RMCAT TRAFFIC

More fair with improved jitter. Jitter peaks are almost same but more sparse.







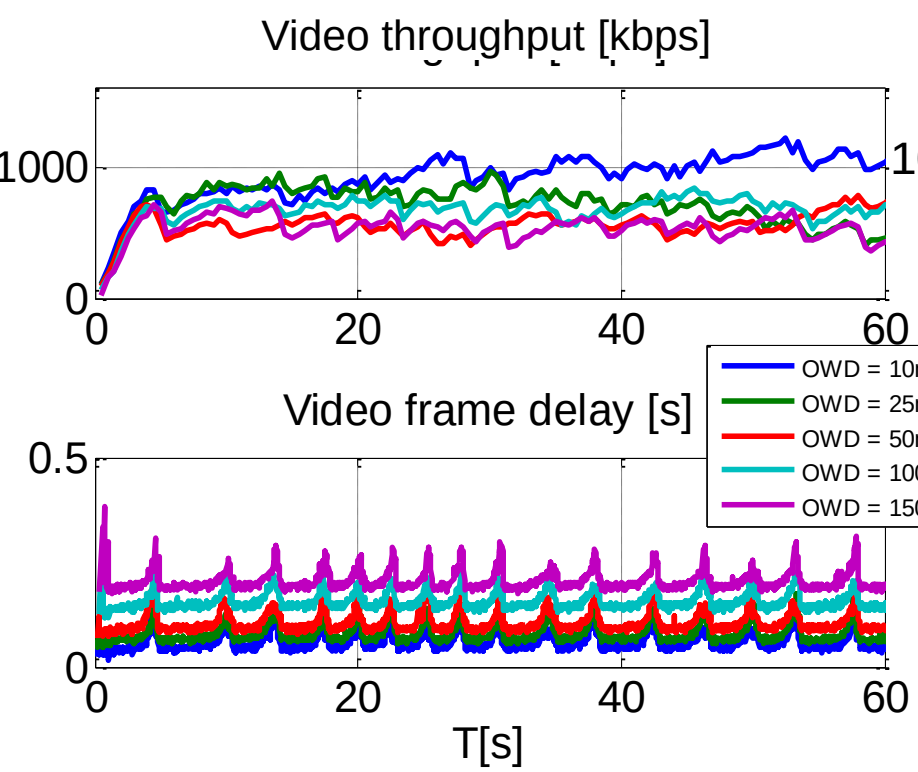


SCReAM-02

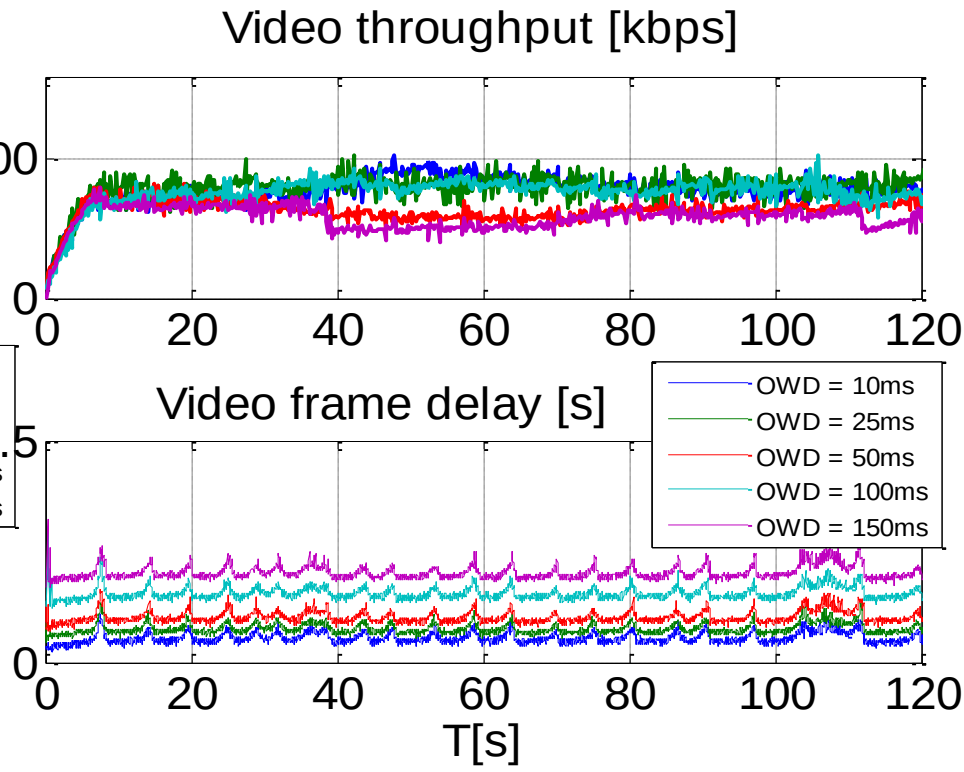
SCReAM-03

RTT FAIRNESS

More fair in terms of video throughput distribution.



SCReAM-02

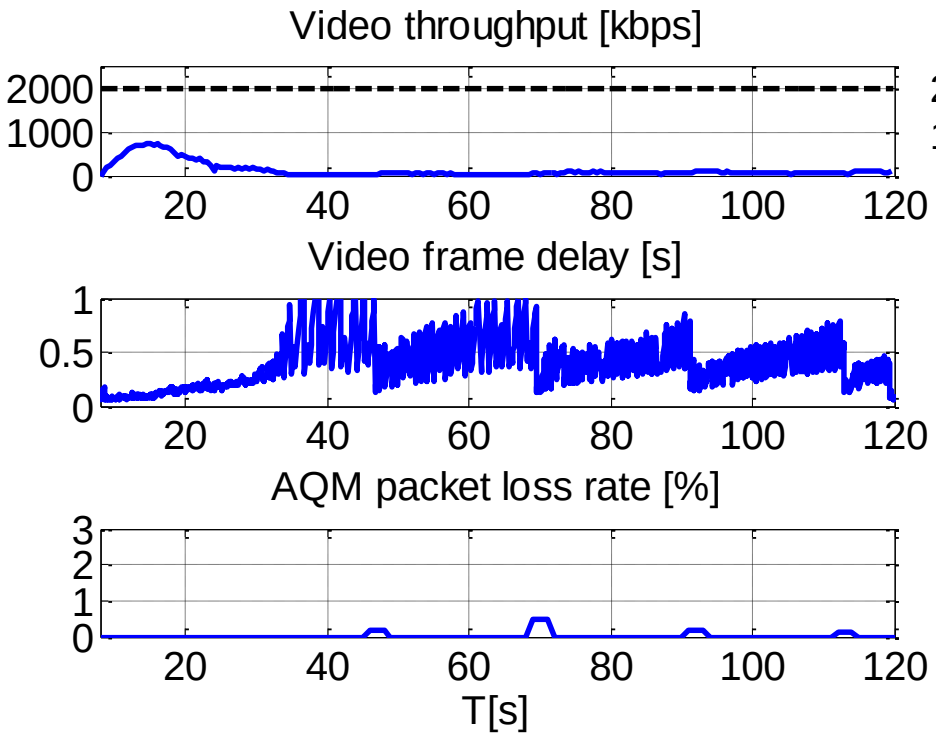


SCReAM-03

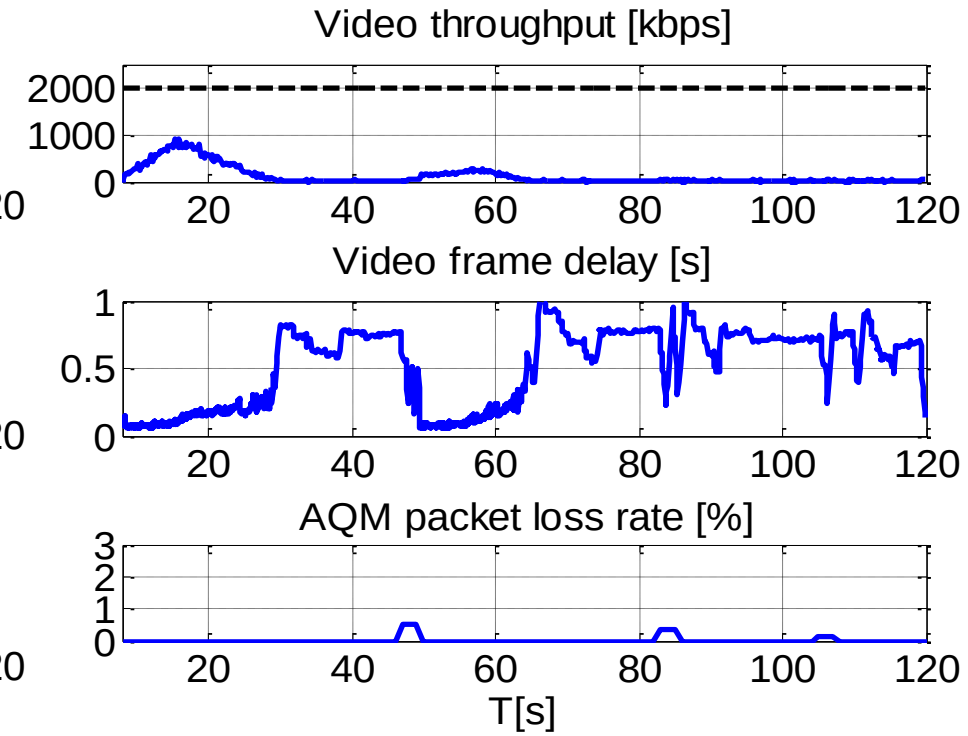
COMPETING TCP TRAFFIC (DROP TAIL 300MS)

Additional delay with SCReAM

- video frames are queued up as the SCReAM network congestion control backs off more in response to packet loss.



SCReAM-02

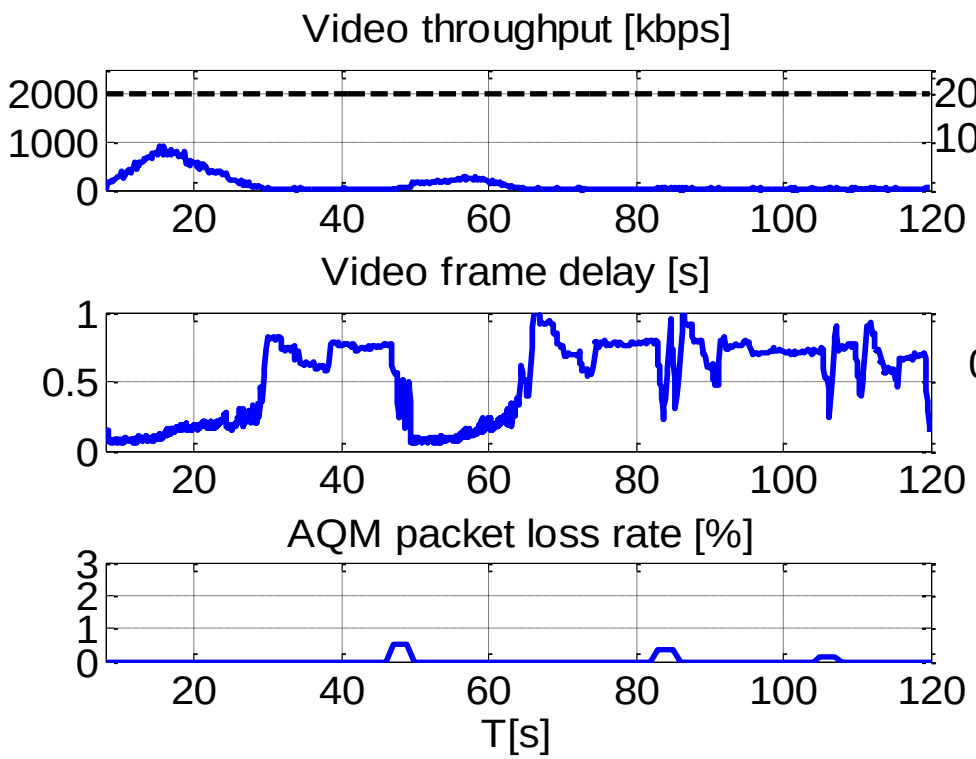


SCReAM-03

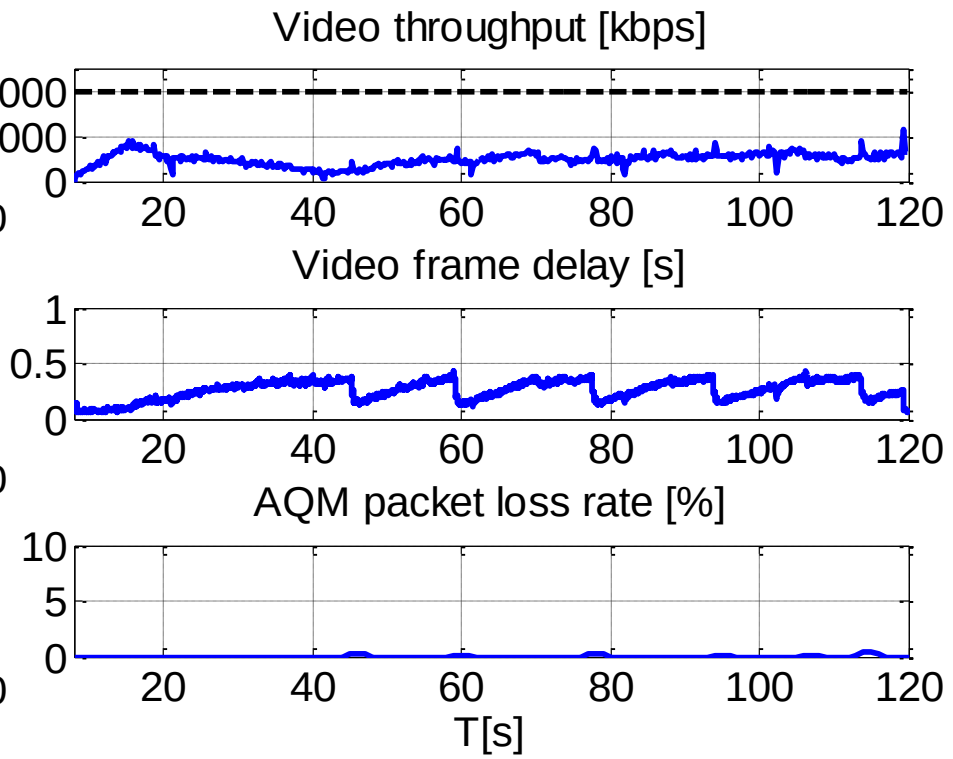
COMPETING TCP TRAFFIC (DROP TAIL 300MS)

The use of frame blanking and competing flow adjustment proved to be unstable

- Needs further investigation (possibly other methods)



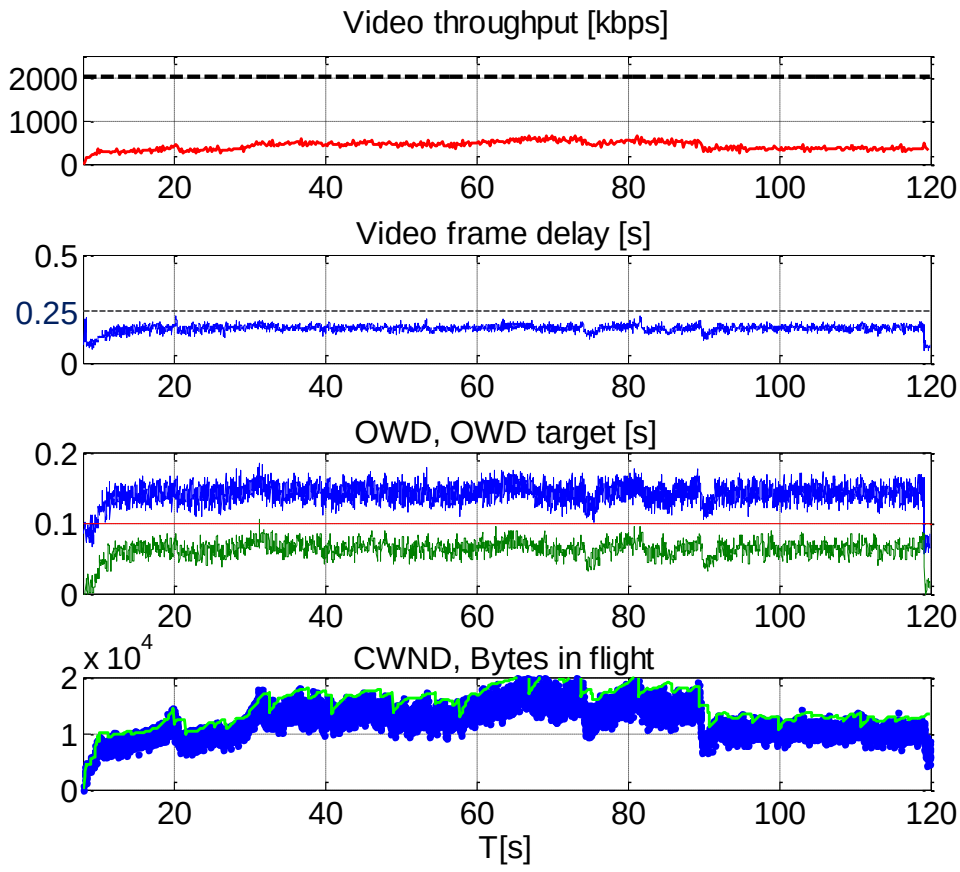
SCReAM-03



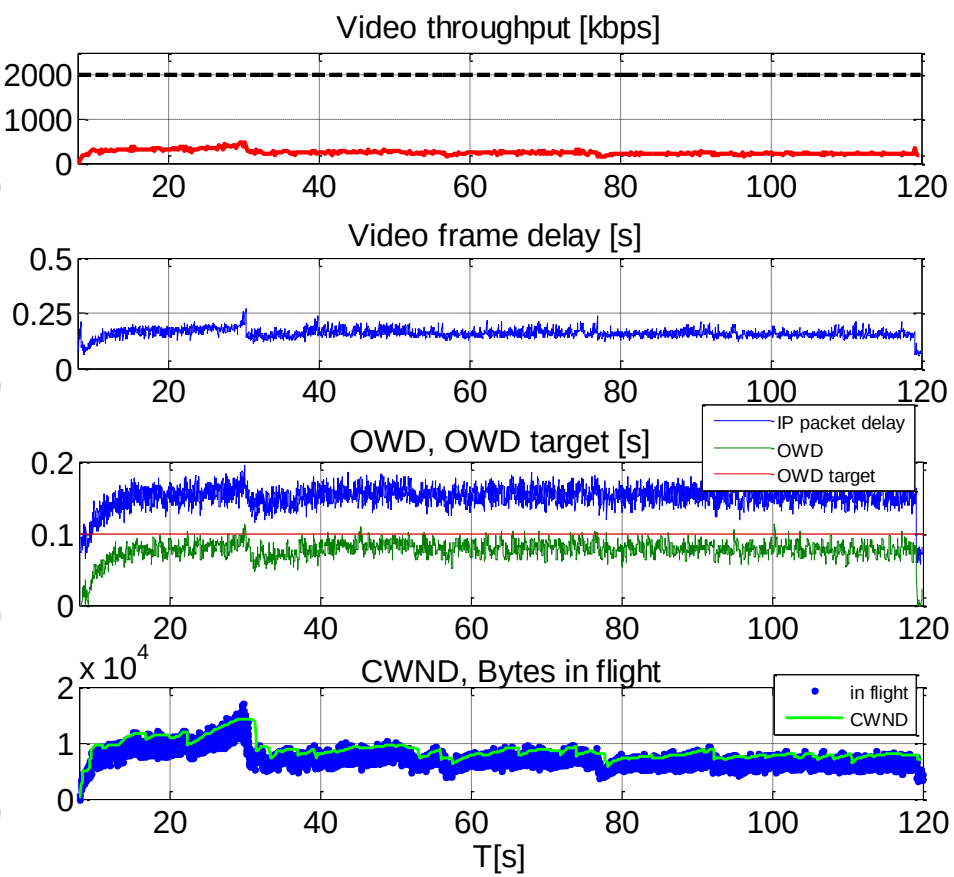
SCReAM-03 with frame blanking And competing flow adjustment

COMPETING LEDBAT TRAFFIC (DROP TAIL 300MS)

Hard to compete against LEDBAT with same delay target but performs relatively better if the LEDBAT delay target is lower.



LEDBAT 80ms



LEDBAT 100ms

CELLULAR TEST CASES EVALUATION

INTRODUCTION

Test cases according to draft-sarker-rmcat-cellular-eval-test-cases-01

- Downlink
  - RTT : 40ms, UE speed : 3km/h, AQM : On; FTP load 4Mbps/cell
- Uplink
  - RTT : 40ms, UE speed : 3km/h, AQM : On; FTP load 2Mbps/cell
- More results are in the extra slides section at the end

Algorithms

- 300kbps fixed bitrate
- **S**elf-**C**locked **R**at**e** **A**daptation for **M**ultimedia (SCReAM)
  - draft-johansson-rmcat-scream-cc-03
    - Video codec frame skipping enabled (threshold 100ms)
  - Two modes
    - **SCReAM ideal** - SCReAM with ideal video source, rate request are meet immediately.
    - **SCReAM non-ideal** - SCReAM with non-ideal video source, rate request are delayed.

METRICS

Latency (IP packet and video frame)	• Average latency • Tail latency : 95% of all users have a e2e latency that is lower than X for 98% of the packets (or frames)
Packet loss rate	• Average Loss rate (whole session) • 98%ile • 90%ile
Bitrate (measured on the receiving side = goodput)	• Average bitrate (last 20 seconds of the user lifetime) • 10% bitrate: Average bit rate for the 10% worst off users
Cell throughput	
Average FTP throughput	

Disclaimer

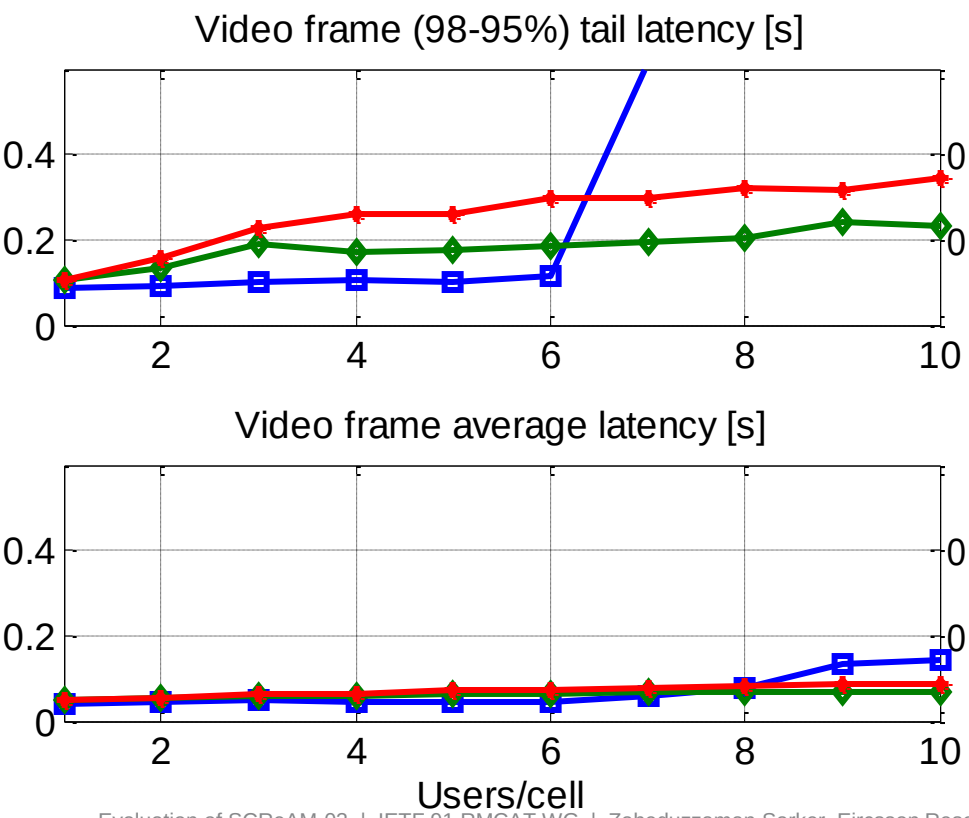
- The users/cell indications and the associated performance metrics should not be treated as exact values as there are lots of dependencies on propagation models, antenna configurations, scheduler implementations, other cross traffic involved. Therefore, the figures should be read as a comparison between congestion control algorithms under the same given network conditions.

VIDEO FRAME LATENCY

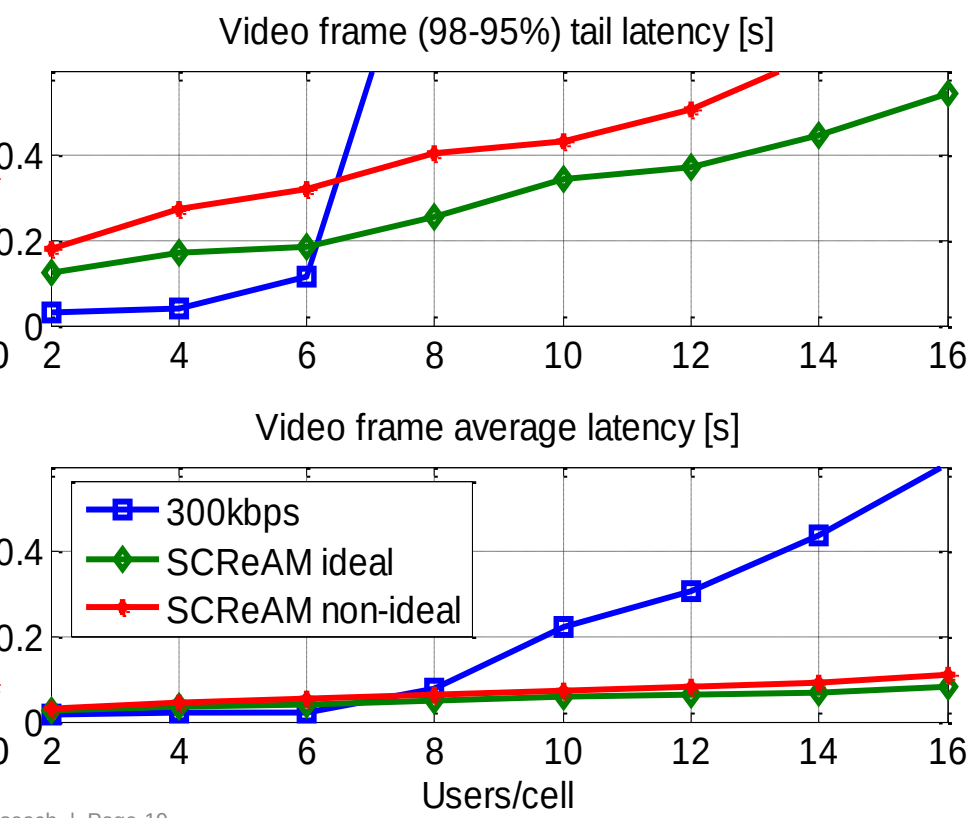
SCReAM keeps the latency low even in high load

- Even if non-ideal video source affects the performance

Uplink

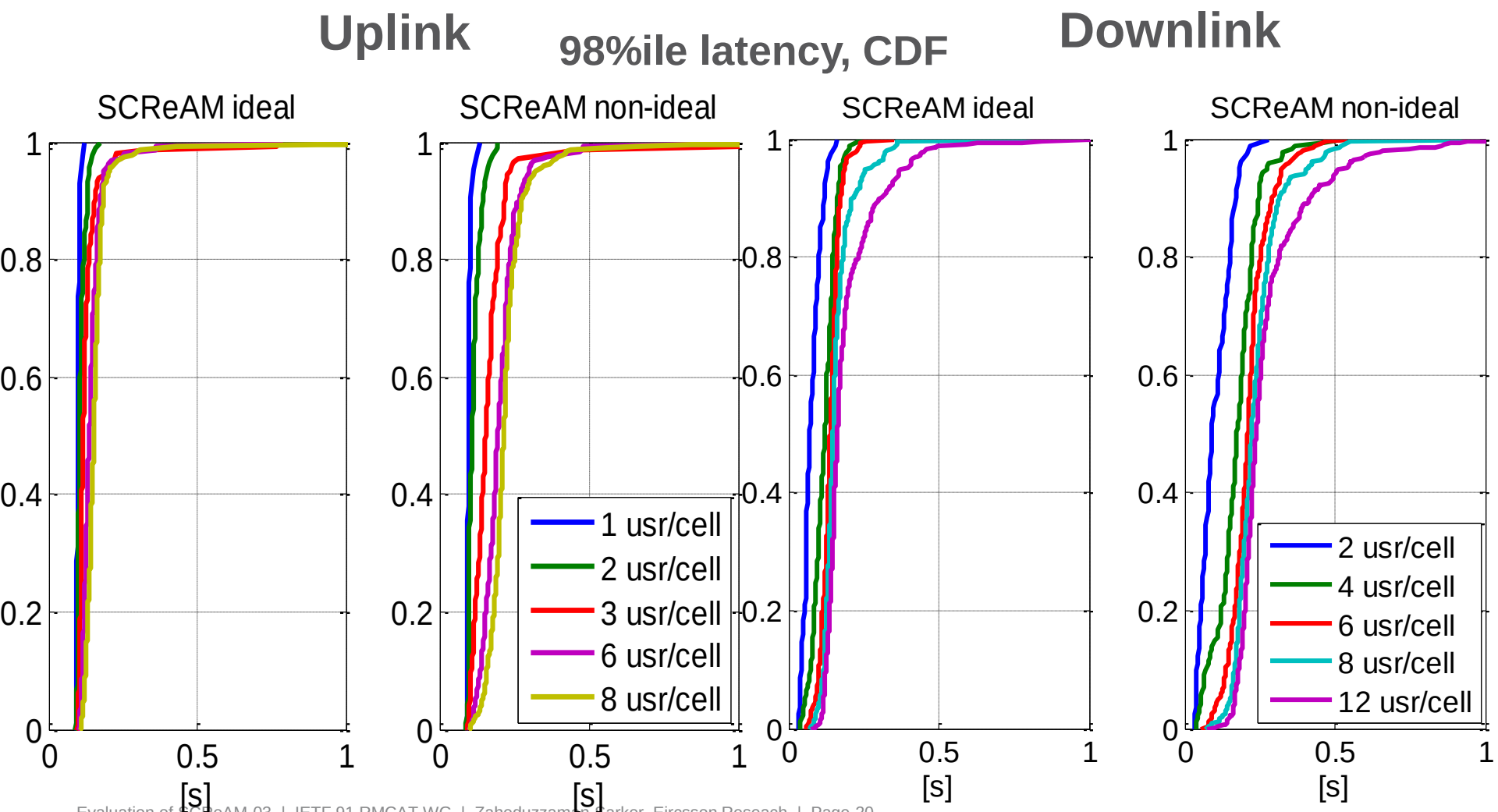


Downlink



VIDEO FRAME LATENCY

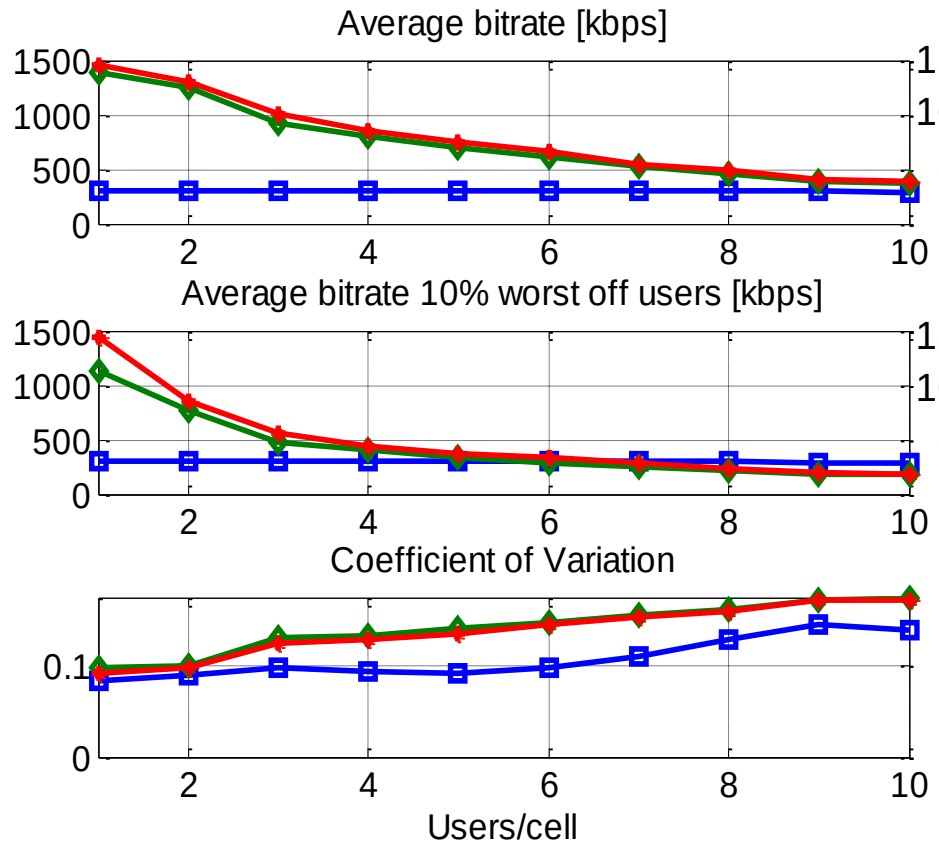
SCReAM keeps the latency low even in high load



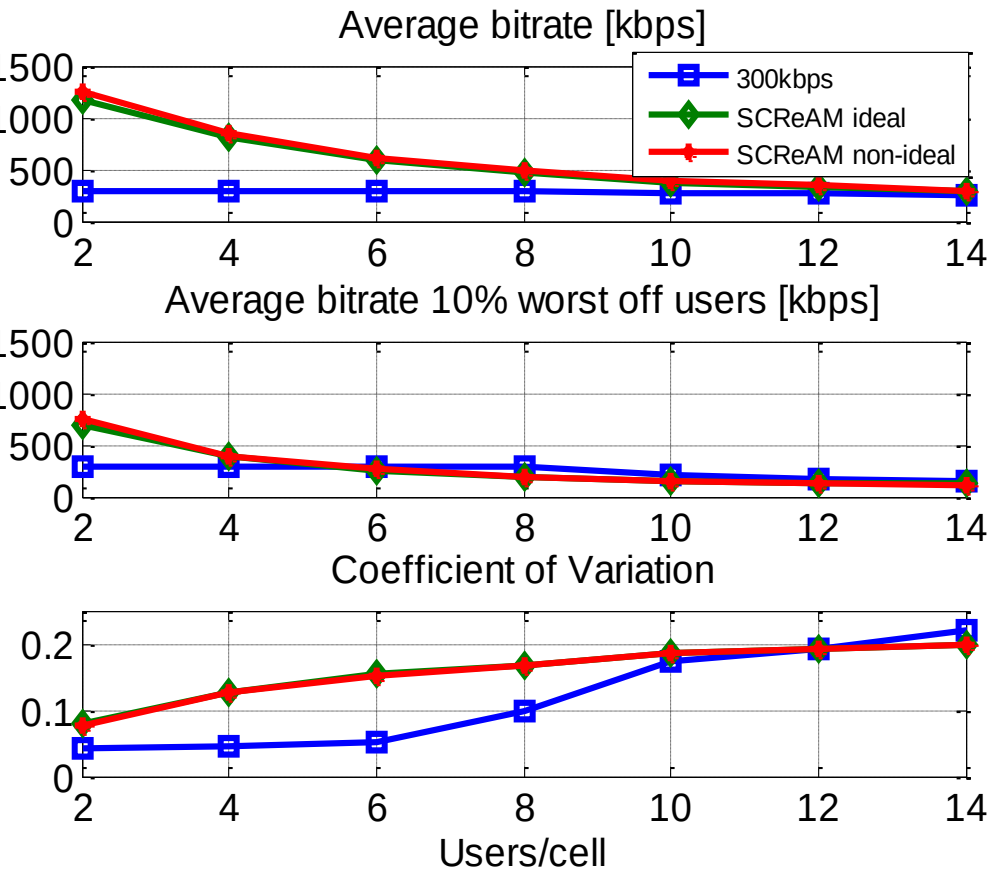
BITRATE

SCReAM keeps the bitrate almost same with both modes of video sources

Uplink



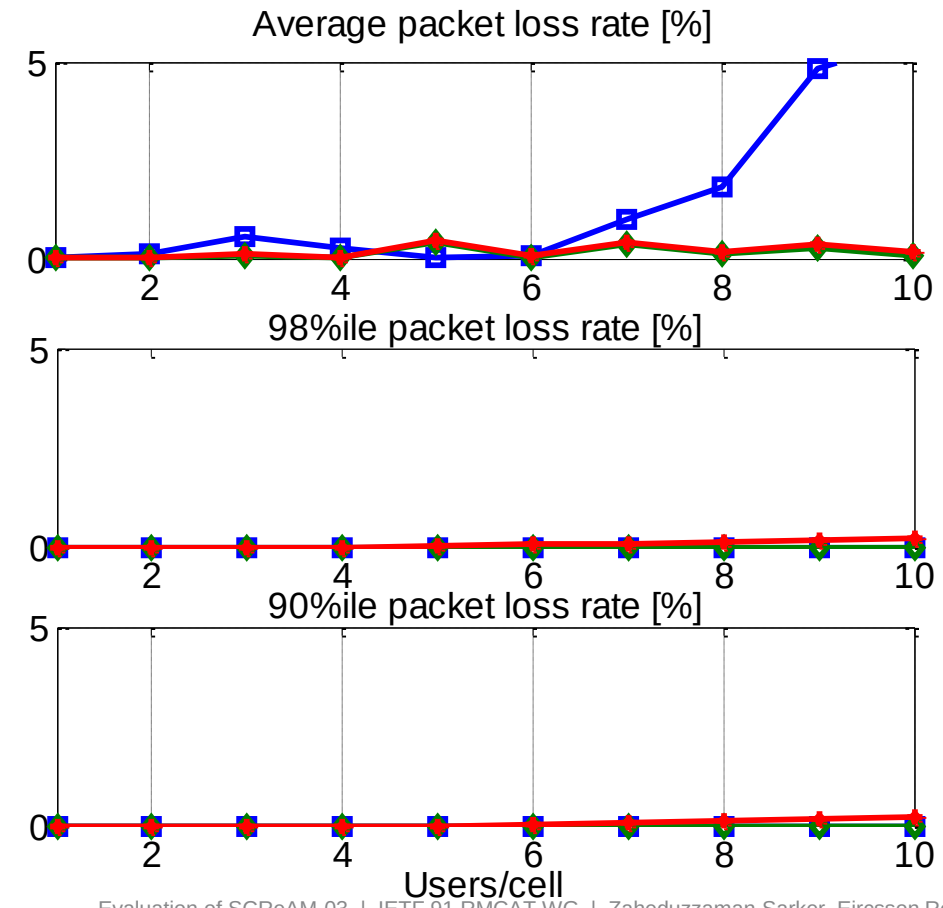
Downlink



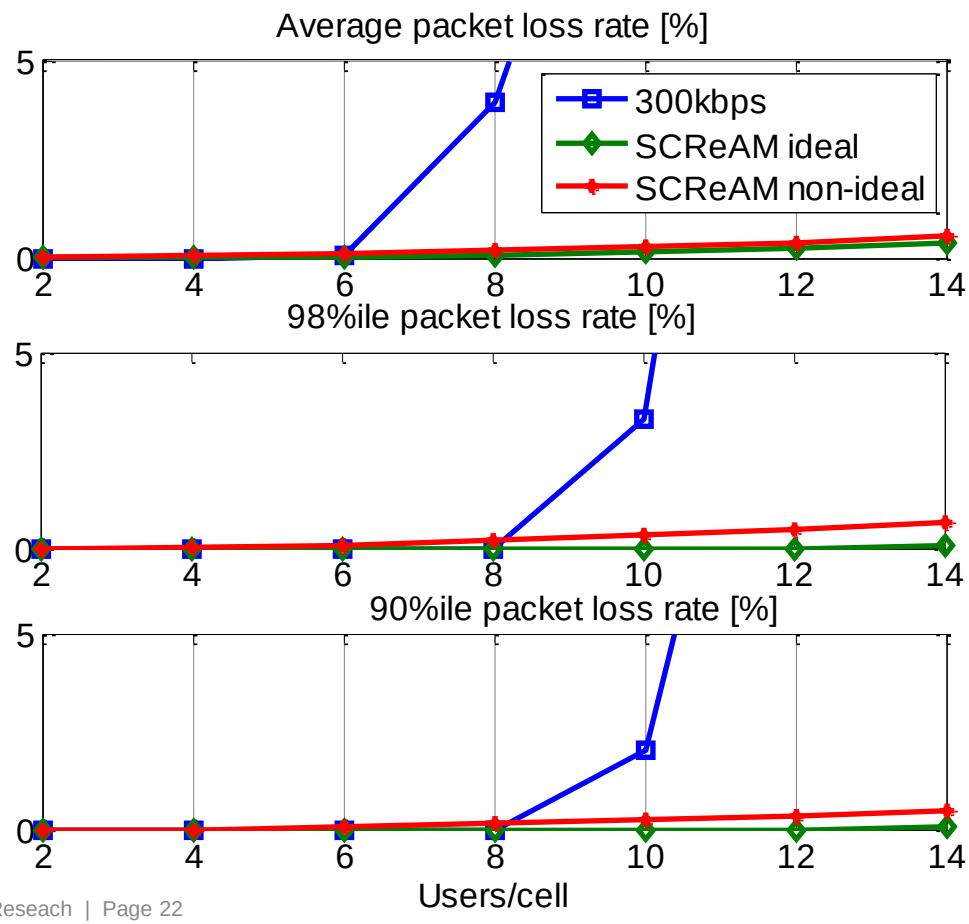
LOSS

SCReAM keeps the loss rate low with both mode of video sources

Uplink



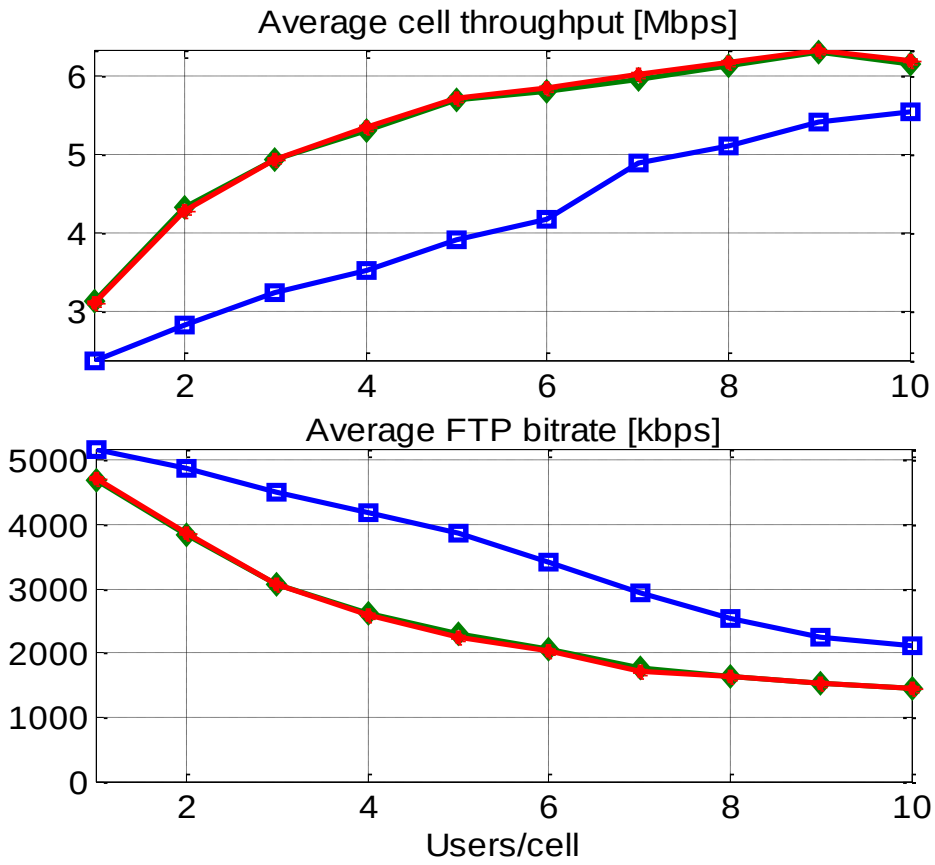
Downlink



THROUGHPUT

SCReAM achieves high cell throughput with both mode of video sources

Uplink



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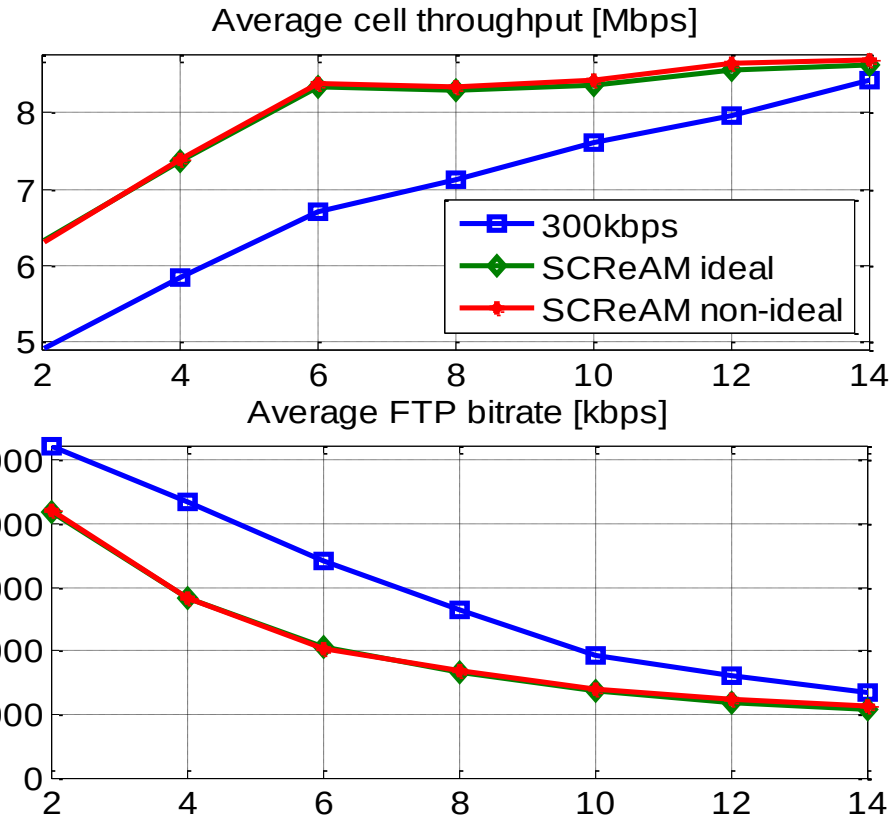

SUMMARY

Basic test cases	SCReAM-03	Improves fairness.
		Less delay spikes and jitter. Delay spikes are more sparse now.
		Still needs to find a better alternative than frame blanking and current competing flow adjustment.
Cellular test cases	SCReAM-03	Non-ideal video source affects the performance a bit. Also proves that RMCAT candidate algorithms need to be tested against non-ideal video sources.
		Still shows stable behavior for both non-ideal and ideal video sources.

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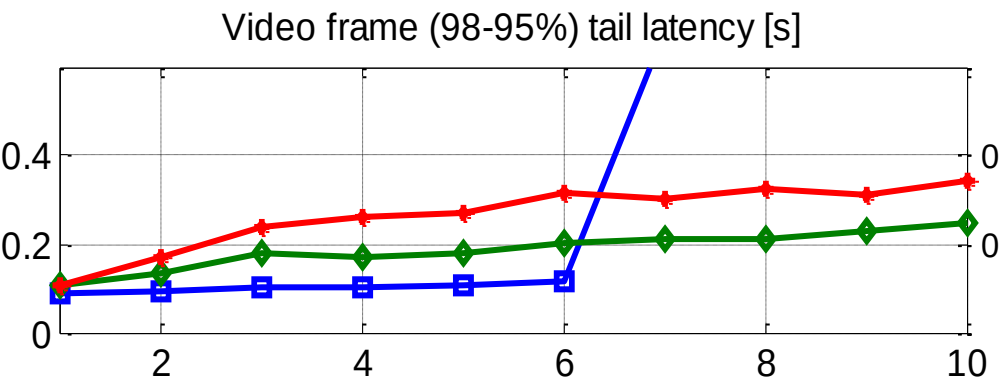
EXTRA SLIDES

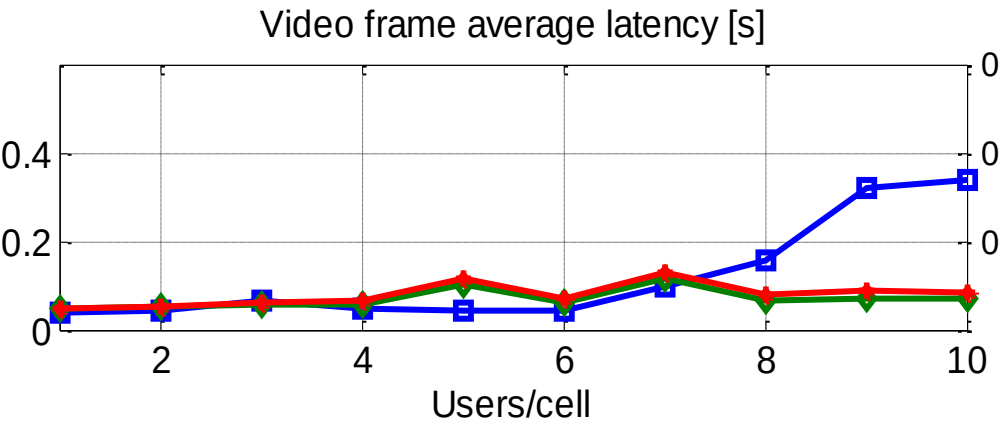
Results from selected test cases with different settings

CELLULAR TEST CASES

RTT 40MS, 3KM/H, AQM OFF
VIDEO FRAME LATENCY

Uplink





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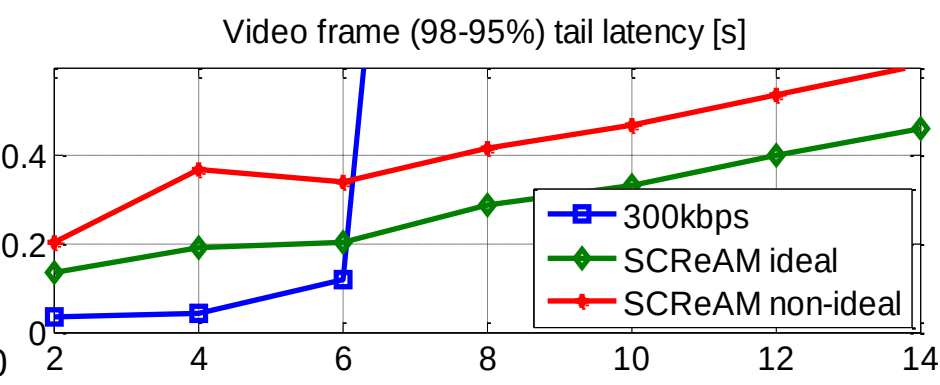
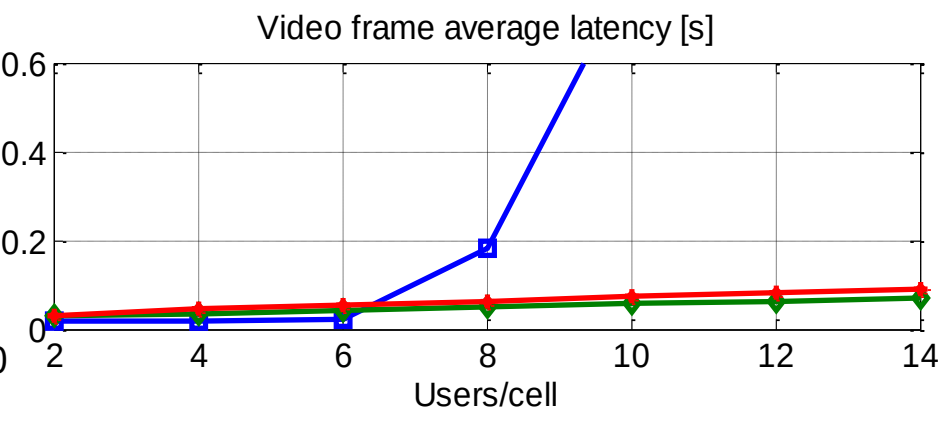
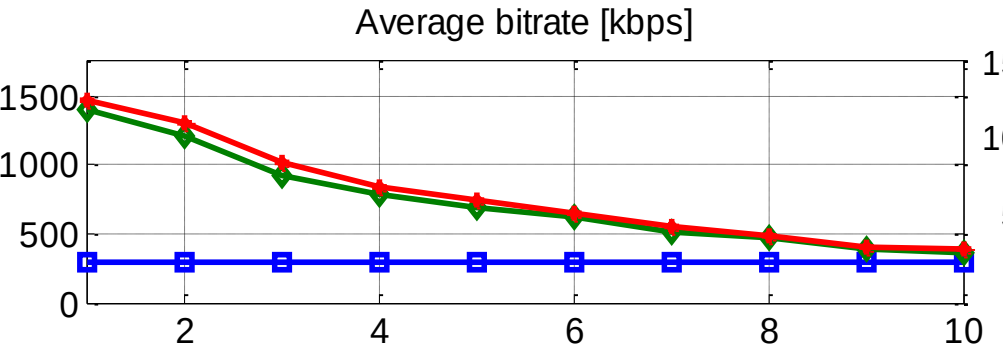
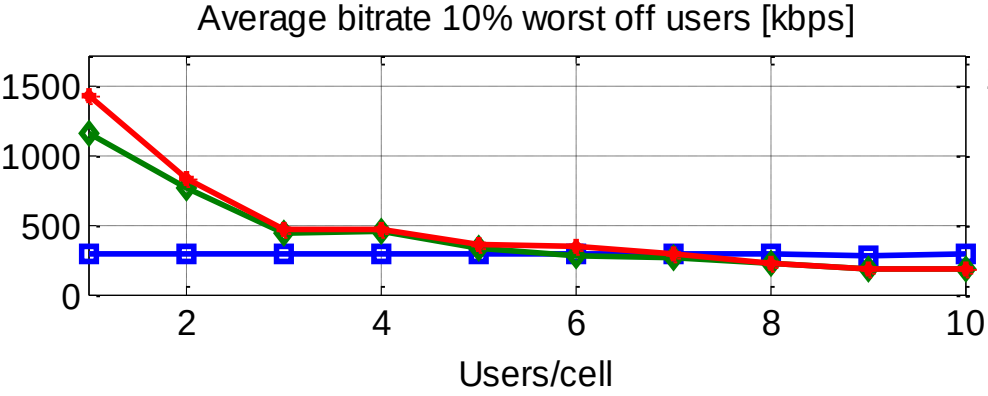




RTT 40MS, 3KM/H, AQM OFF BITRATE

Uplink





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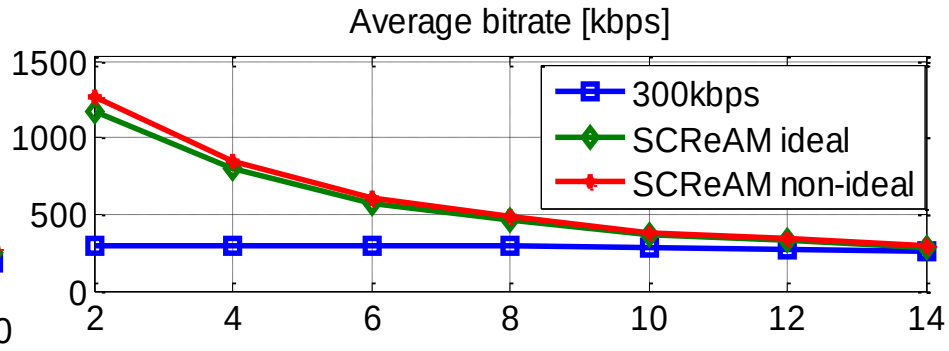
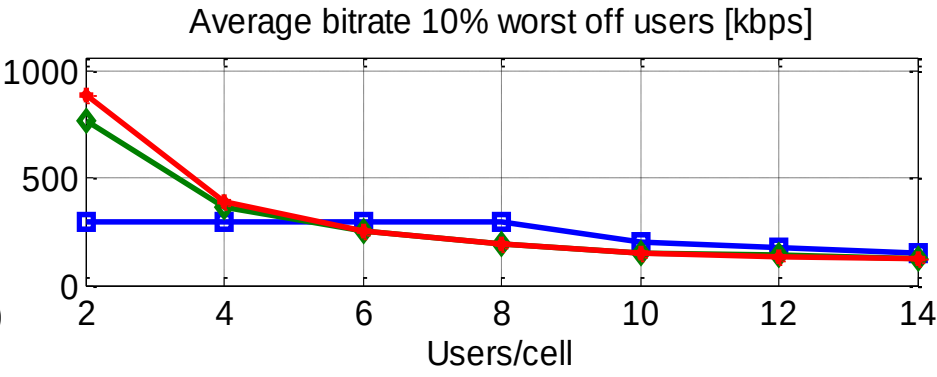
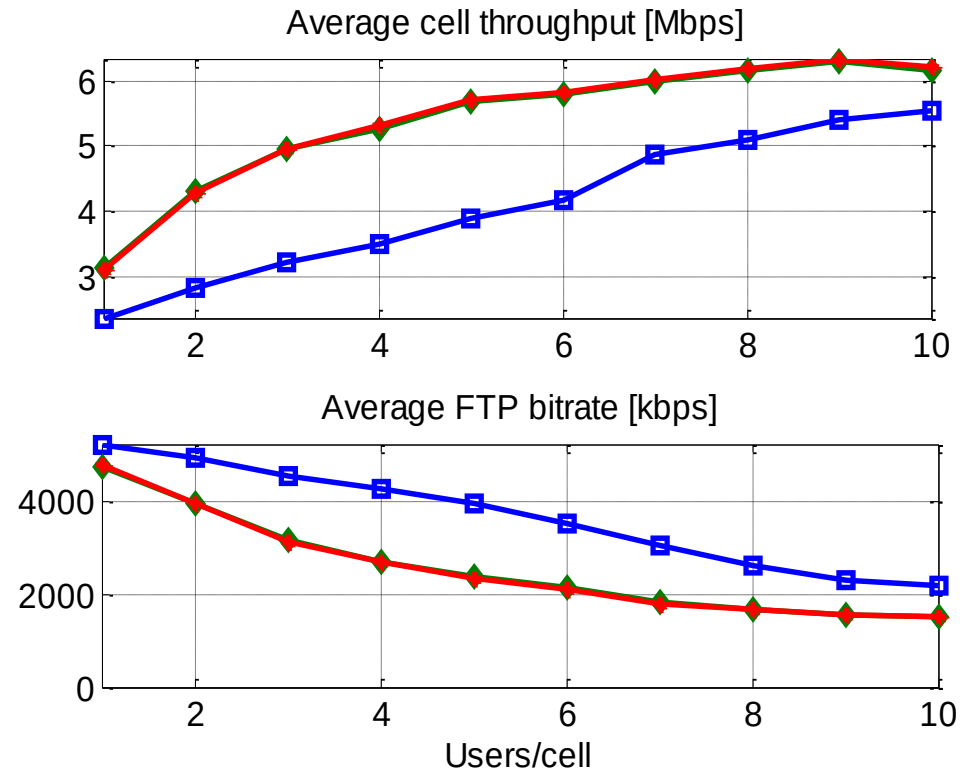




RTT 40MS, 3KM/H, AQM OFF
FTP AND CELL THROUGHPUT

Uplink



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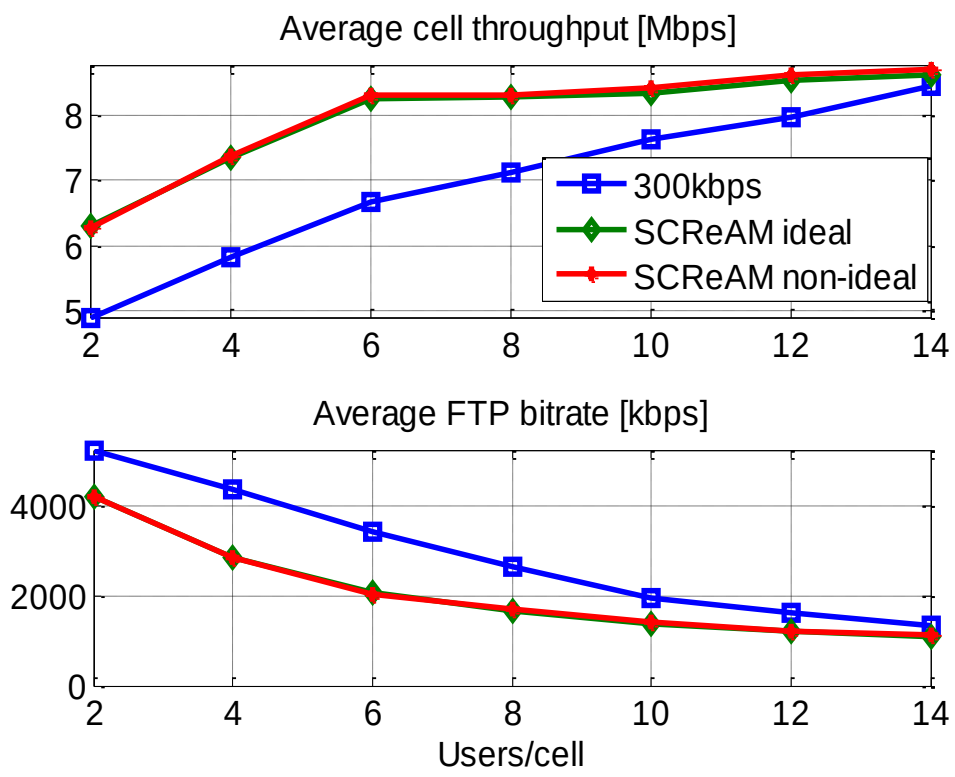
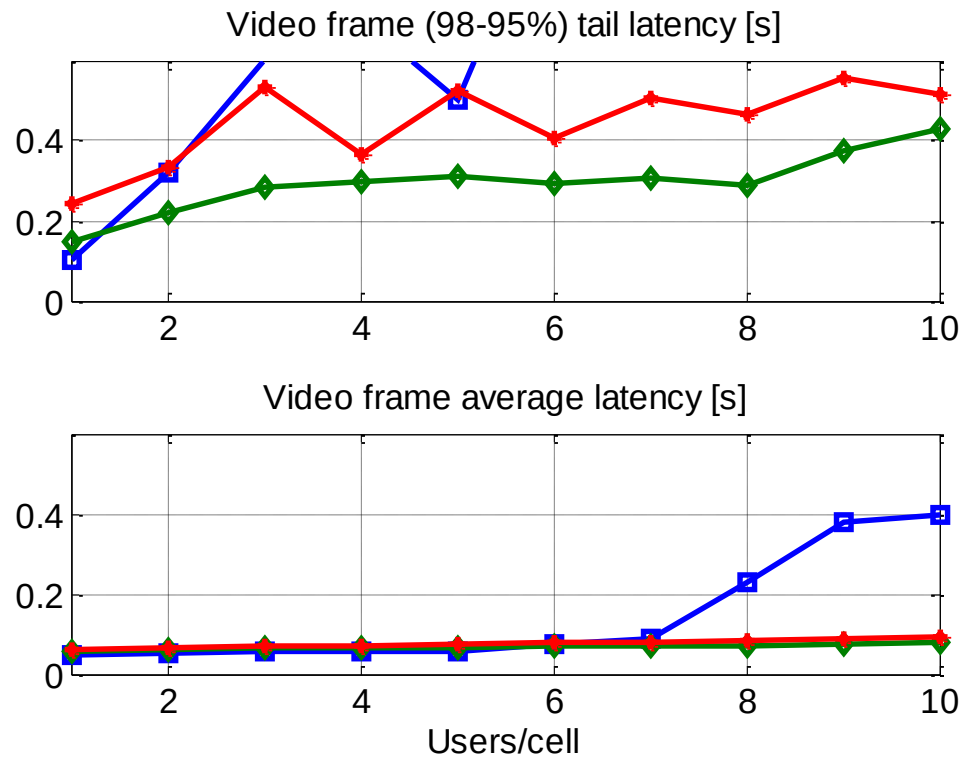


RTT 40MS, 30KM/H, AQM ON VIDEO FRAME LATENCY

Uplink



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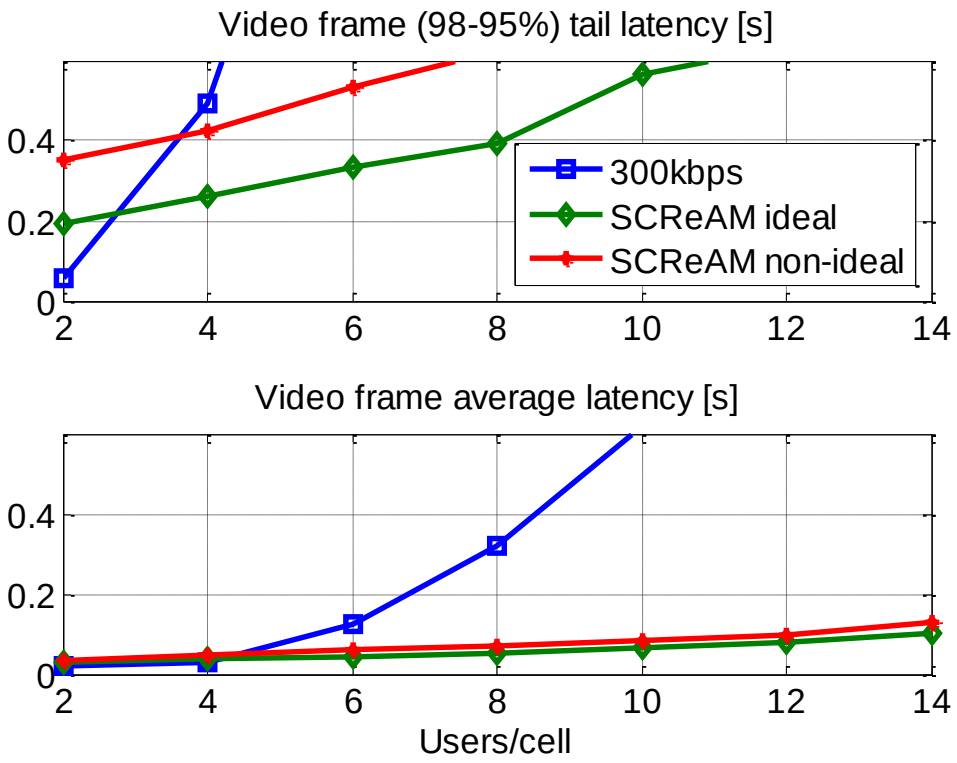
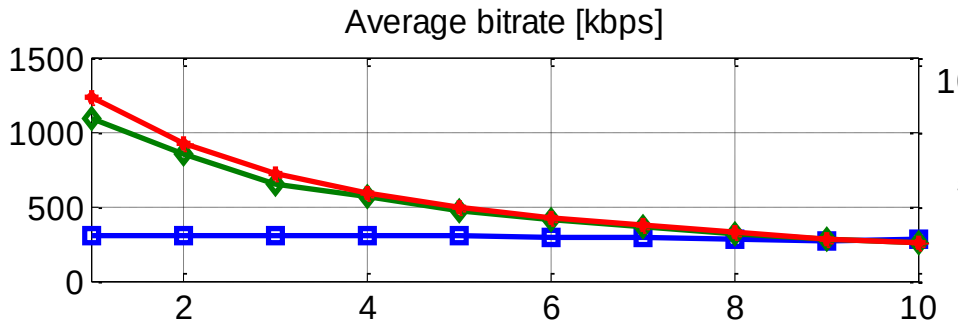
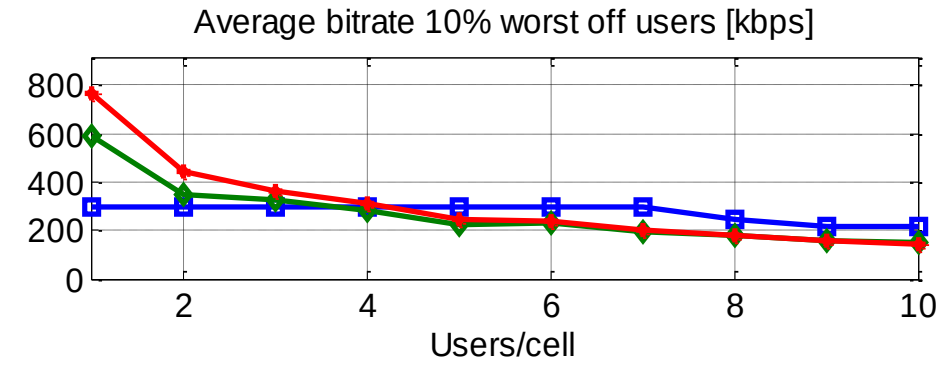


RTT 40MS, 30KM/H, AQM ON BITRATE

Uplink





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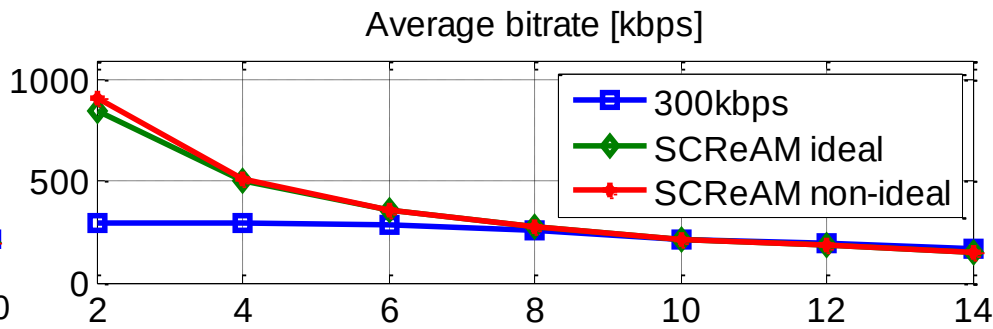
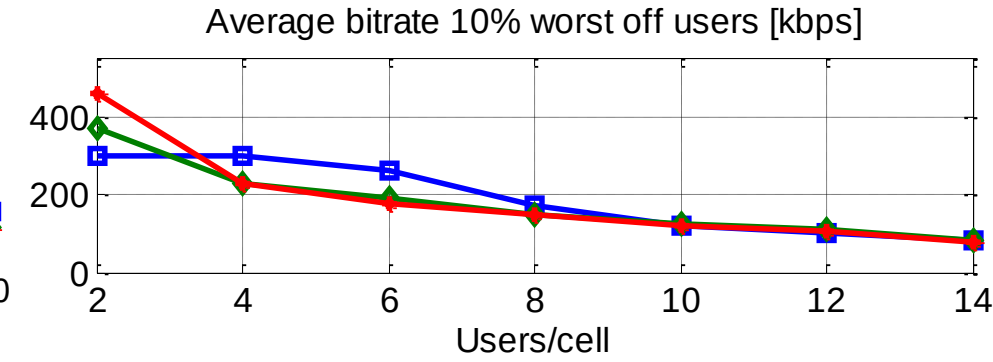
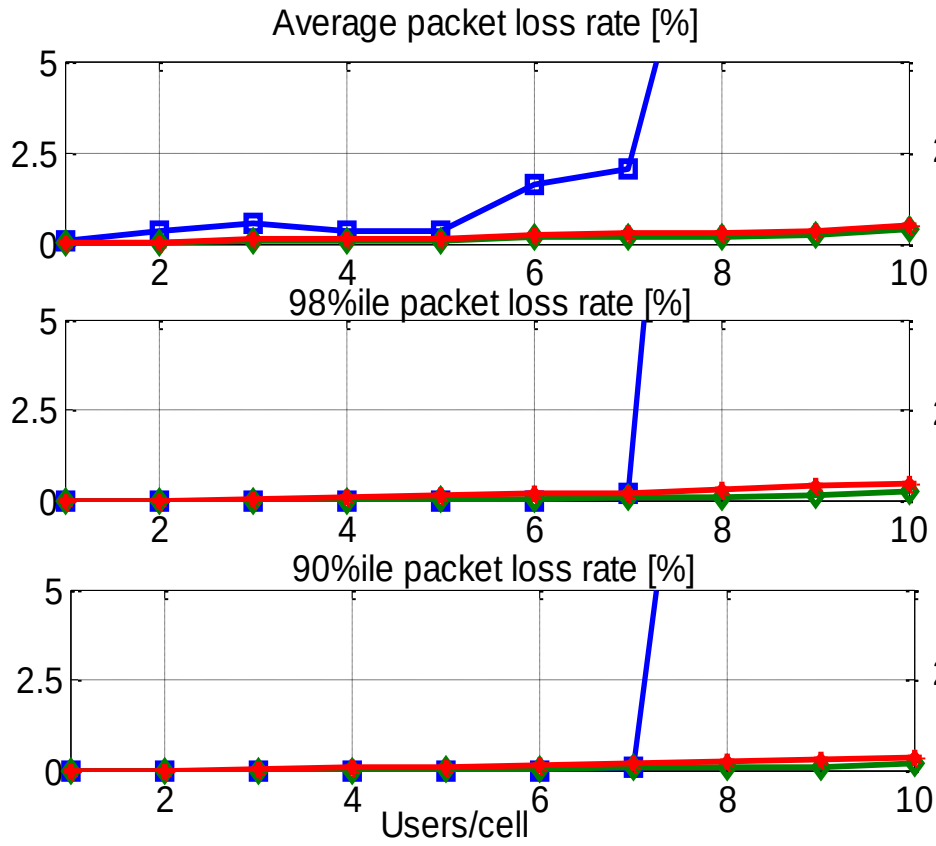




RTT 40MS, 30KM/H, AQM ON PACKET LOSS

Uplink



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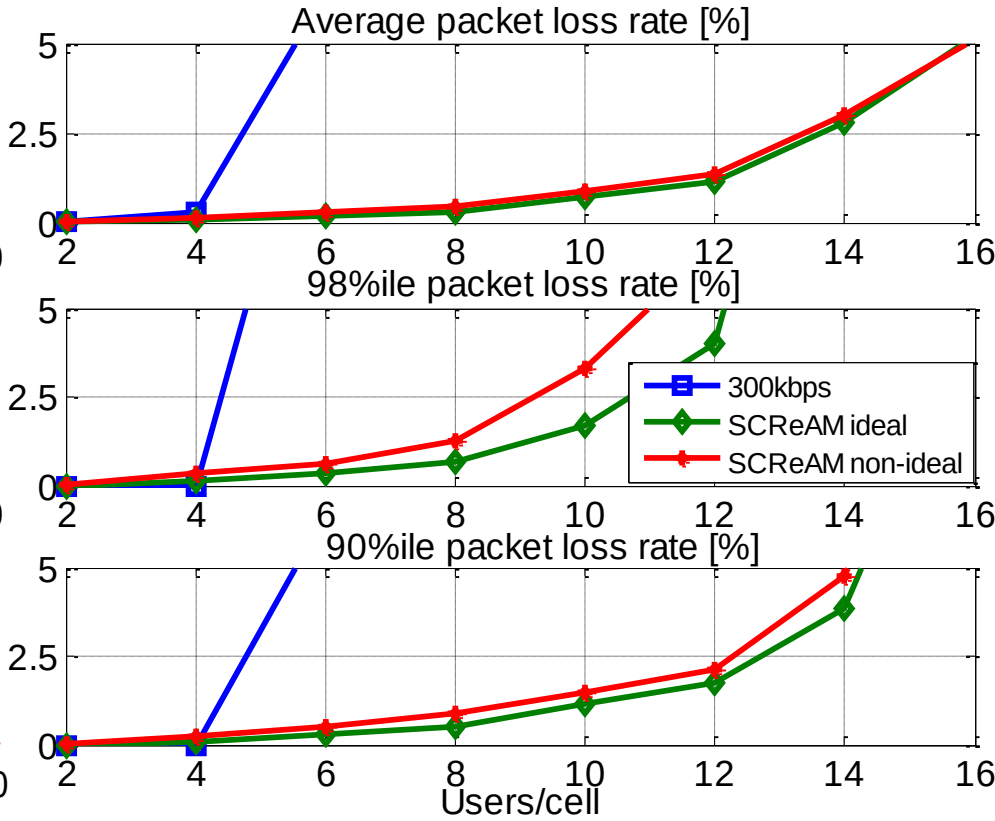
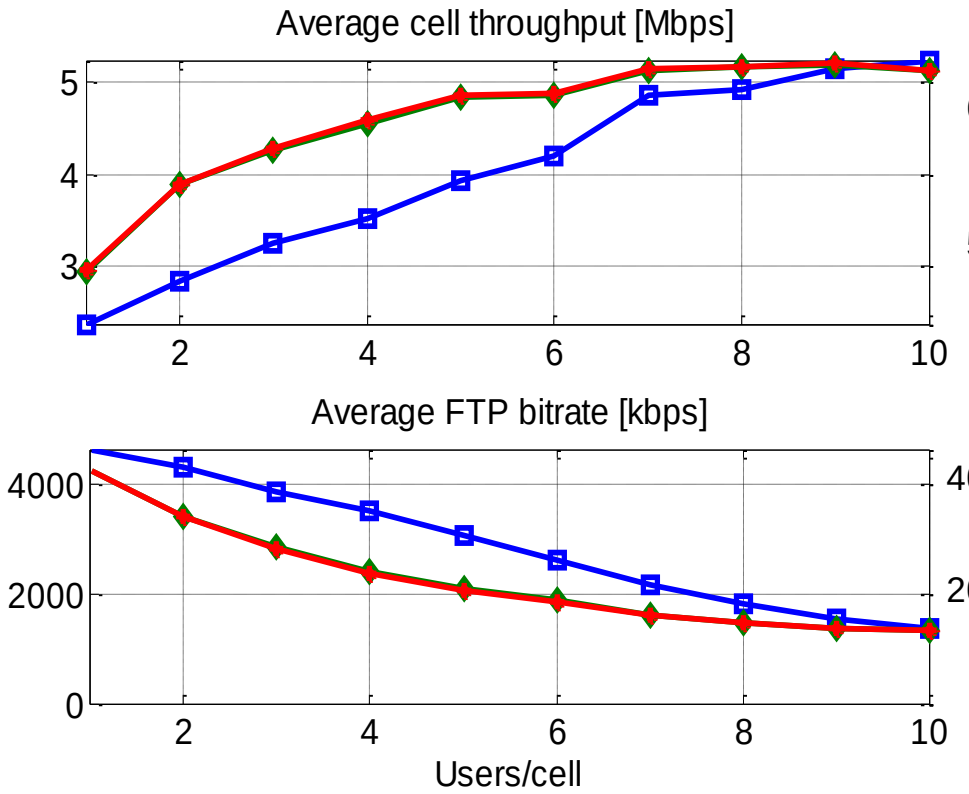
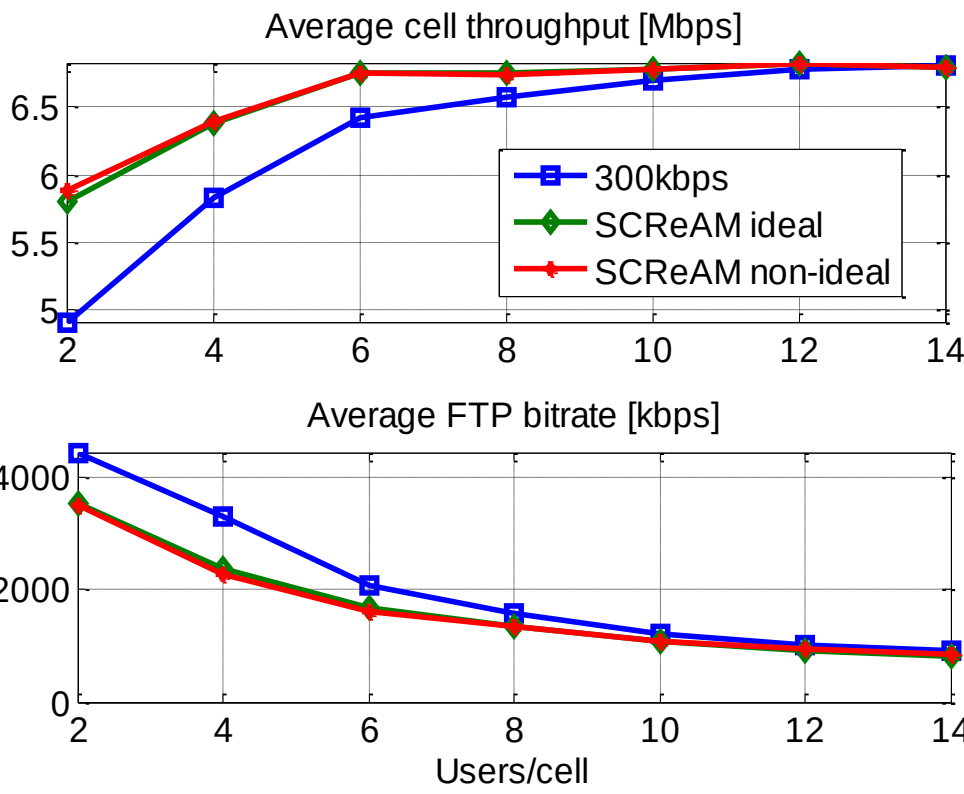


RTT 40MS, 30KM/H, AQM ON FTP AND CELL THROUGHPUT

Uplink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