UiO : Faculty of Mathematics and Natural Sciences
University of Oslo

Tightly Coupled Congestion Control in WebRTC

Michael Welzl

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Context

- draft-ietf-rtcweb-use-cases-and-requirements-09.txt :
  - "The browser MUST support priortization of streams and data."
    e.g.: online game (control traffic = important)
    with audio (less important)

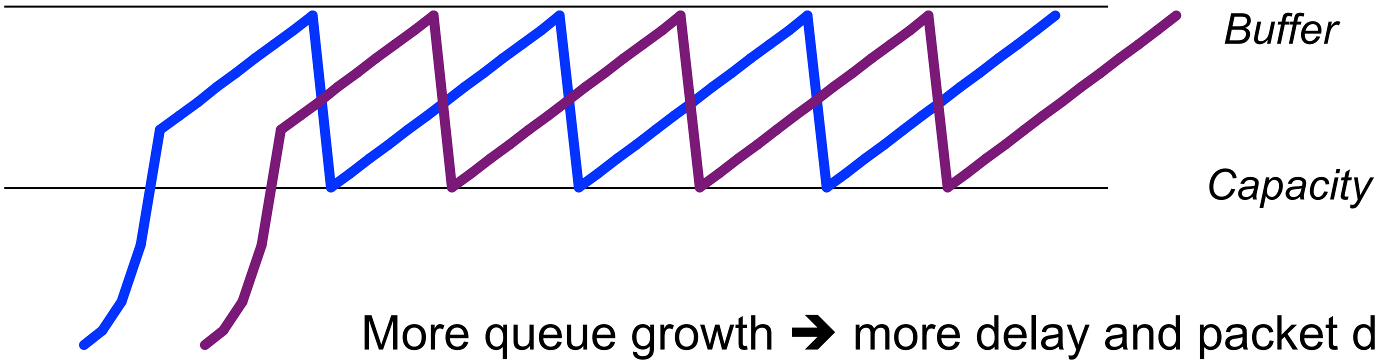
- IETF RTP Media Congestion Avoidance Techniques (RMCAT) WG is now chartered
  - Focus broader, but really made for WebRTC
  - Charter contains:
    "Develop a mechanism for identifying shared bottlenecks between groups of flows, and means to flexibly allocate their rates within the aggregate hitting the shared bottleneck."

Why is this a big deal?

- Because doing it right gives us extra benefits
- Because it’s a unique chance to do it right

Up to now: doing it wrong

- Priorities in practice, in today's Internet
  - More flows get more than one
  - Mostly TCP, with congestion control trying to reach a certain notion of fairness
    - This "fairness" has been critized a lot (e.g.: depend on RTT)
    - Doesn't get better with N vs. M TCP's



More queue growth ➔ more delay and packet drops

How to fix this

- The problem can be solved with a single Congestion Control instance (as with the Congestion Manager, RFC3124)
  - But solving it <u>in general</u> is hard – RFC3124 leaves some key issues unresolved + benefits weren't shown
    - shared bottleneck or not?
    - overally less aggressive CC – bad e.g. for short flows?

    ... all at the cost of a complex implementation!

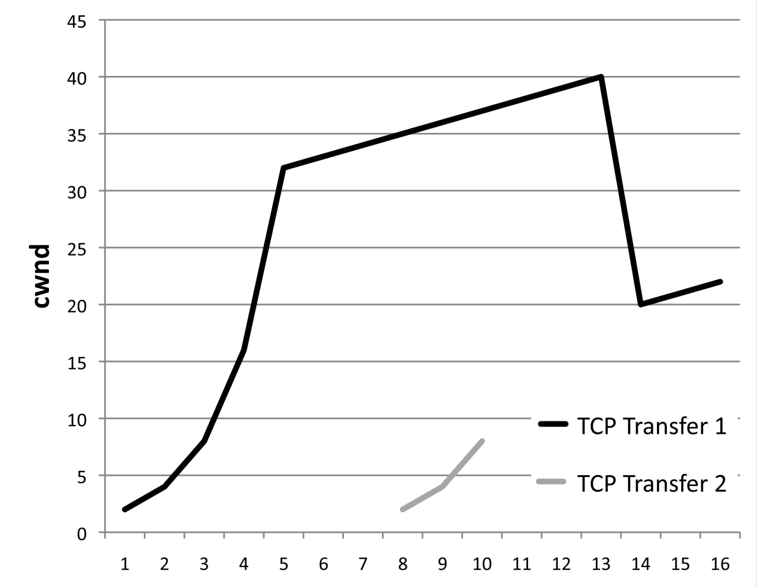
- But we could do this right for rtcweb
  - Common bottleneck is assumed (all-over-one-5-tuple)
  - long connections are somewhat likely

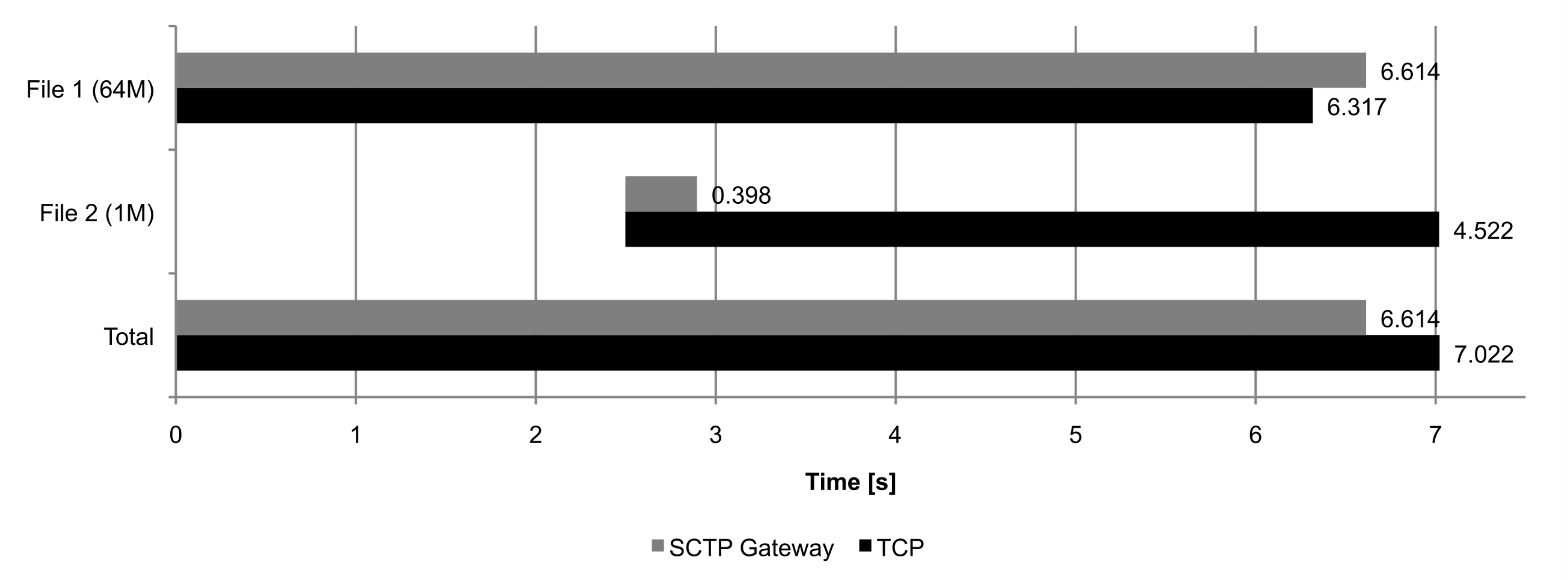
Doing it right

- Act like one flow, with aggression tuned correctly (or: as desired by the user)
  - Less delay
  - Less packet loss
  - Less signalling
    (N flows don’t need N*feedback about the same path)
  - More controllable behavior
    (sender-side scheduling vs. “fighting it out” on the bottleneck)
  - Better performance for short or application-limited flows
    (TCP does use it or lose it; with shared congestion control, if flow 1 doesn’t use it, maybe flow 2 does.
    Skip slow start: again less queuing delay from slow start overshoot)

Prototypical example

Michael Welzl, Florian Niederbacher, Stein Gjessing: "Beneficial Transparent Deployment of SCTP: the Missing Pieces", IEEE GlobeCom 2011, 5-9 December 2011, Houston, Texas.

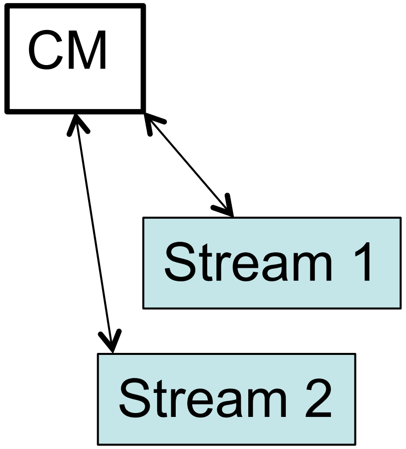




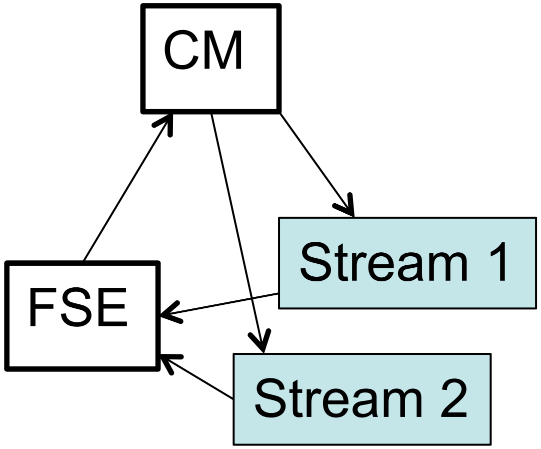
“Flow State Exchange” (FSE)

- The result of searching for minimum-necessary-standardization: only define what goes in / out, how data are maintained
  - Could reside in a single app (e.g. browser) and/or in the OS
  - Probably needed on sender <u>and</u> receiver side

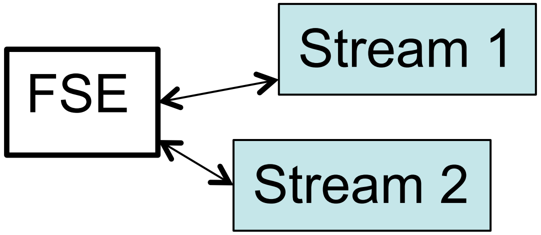
Traditional CM



FSE-based CM



Another possible implementation of flow coordination



Conclusion

- RMCAT has been formed, and quite some interesting things could come out of it
- Coupled congestion control is one of them
- Ideally, yields perfect fairness control, reduced delay, less drops, better performance in general
- Realization: FSE is one possible way; discussions have only just begun

Thank you!

Questions?