NC and Congestion Control: problem statement, potential approaches and status

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Problem Statement

• Most of the internet is quite reliable, but a significant proportion is not
  - This leads to packet loss
• FEC/XOR with multiple path has been used for many years to recover lost packets.
• But about half of the loss on the Internet consists of more than one consecutive lost packet hence XOR or repetition codes are not performing even with high overhead
  - Hence the need for more structured codes
• Even small amounts of loss have a very significant effect on transmission rates when the bandwidth delay product is very large (several megabytes).
  - This happens for transoceanic links at rates of about 100 Mbits per second).
  - With long RTT times, FEC can shorten the recovery time significantly.
Problem Statement

- However it has been widely documented that the use of FEC hides the congestion control information that TCP uses.
  - This can create a situation where a FEC protected connection might be harmful to the network, as well as counter-productive to the application.

- There are instances of loss on the network where a reduction in bandwidth is NOT required to protect the network.
  - Short term and “spiky” events that impact the network sporadically.

- At the same time there also see instances where it is necessary to reduce bandwidth to protect the network.
  - More chronic and long term events.

- There are instances of both types of loss over operational networks (loss requiring action and loss that does not).
Potential Approaches

• A non-loss based algorithm such as BBR (bottle neck bandwidth and round trip propagation time) might provide new insights to the co-existence of NC and TCP.
  - https://queue.acm.org/detail.cfm?id=3022184
  - Under investigation.
• Sending loss information from the FEC to a congestion control would be another.
  - Could be the best solution.
  - But may add complexity and potential non-standard solutions.
• Other?
  - Use ECN information to distinguish between congestion losses and others:
  - Work on NC and TCP at MIT and the Hamilton Institute (under patent protection)
    • TCP/NC and NC/TCP
  - Work from ISAE (presented in the same segment)
Status

• The interaction between CC and NC has been identified as a major issue for the RG’s future work.
  – Patented work from MIT/Hamilton institute on NC/TCP and TCP/NC provides background.
  – On-going work will be reported to the group as it happens.
• Draft to be produced (London or Montreal).
• Collaborators welcome.