

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 year sto 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 a 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:
    - <https://tools.ietf.org/html/draft-bagnulo-tcpm-generalized-ecn-04>
  - 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.