Careful Convergence of Congestion Control from Retained State

draft-ietf-tsvwg-careful-resume-01

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Careful Resume, CC at startup

- **Reconnaissance Phase**
  Validate RTT
- **Unvalidated Phase**
  Confirm cached BDP (paced jump)
- **Normal Phase**
  Normal CC (Cubic,...)
- **Safe Retreat**

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Update since Adoption

• Changed to PS
• Aligned terms
• Some initial text on flow control interactions ...
State of CR Implementation

- **ns-3 model of Careful Resume for TCP**
  - Reconnaissance, Unvalidated, (Safe Retreat to be do evaluated)
  - TCP Cubic + Hystart++ modification
    - [https://github.com/rsecchi/quicoptsat](https://github.com/rsecchi/quicoptsat)

- **Linux fork of Careful Resume**
  - Cubic Congestion Control
  - Uses FQ for pacing of unvalidated

- **Careful Resume for QUIC (next)**
  - BDP_Frame (to negotiate flow credit, etc.)
Simulated Performance over LEO/GEO satellite: IW=10, Jump=BDP/2, CR+Pacing, no competing traffic

- LEO scenario, BDP=400 MSS
- GEO scenario, BDP=2100 MSS

Bandwidth=100 Mb/s, RTT=50 ms

Bandwidth=50 Mb/s, RTT=500 ms

~3 RTT benefit

~4 RTT benefit

BDP smaller for LEO case
Careful Resume, Gain in RTTs vs transfer size

Bandwidth=50Mb/s, RTT=500ms

- CR, cwnd=900
- Cubic, IW=10
- Cubic, IW=900

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Pacing during Reconnaissance (first RTT)

Reconnaissance

Unvalidated (Paced)

No Pacing IW & Jump at 10th ACK

Pacing IW & Jump at 10th ACK

Start Reconnaissance Phase

~ 1 RTT

~ 0.5 RTT

~ 1 RTT

~+ 0.5 RTT

Complete Unvalidated Phase

Complete Unvalidated Phase

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Pacing during Reconnaissance (first RTT)

- No Pacing IW & Jump at 10th ACK
- Pacing IW & Jump at 10th ACK
- Pacing IW & Jump at 1st ACK

Reconnaissance
Unvalidated (Paced)

~ 1 RTT
~ 0.5 RTT
~ 1 RTT
~+ 0.5 RTT

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Completion Time and Pacing

Bandwidth=100Mb/s, RTT=50ms

~0.5-1 RTT cost for pacing

CR, IW paced
CR, IW paced & prog. growth
CR, jump at 1st ACK
CR, IW not paced

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And there is flow-control also!

- rwnd/flow credit is set by the receiver
- Receiver typically autotunes rwnd and this restricts the actual growth.
- Receiver would not a-priori set rwnd/flow credit for a cwnd jump
- ... see draft-kuhn-quic-bdpframe-extension
Planned Next Steps for IETF-118

• Results for QUIC

• Explore Safe Retreat Response
  • How to reset the cwnd after a loss in the Unvalidated Phase?
  • cwnd = IW, cwnd = 2*IW?
  • Specifying the Safe Retreat Phase!

• More WG “help” is always helpful!
  • Which path scenarios ought we consider?