

ConEx Abstract Protocol What's the Credit marking for?

[draft-mathis-conex-abstract-mech-00.txt](#)



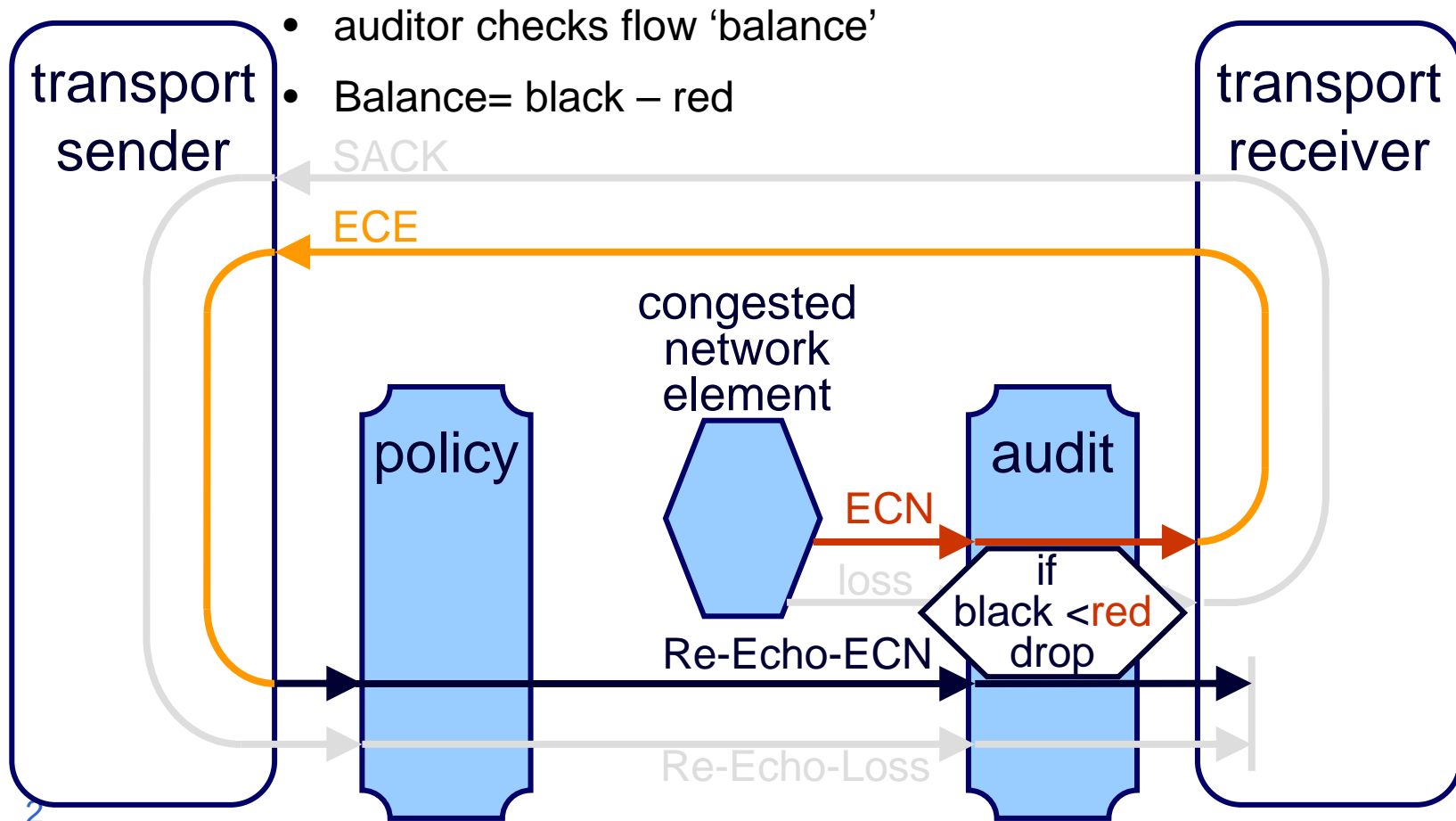
apologies from **Bob Briscoe**, BT
presented instead by Andrea Soppera, BT
IETF-79 ConEx Nov 2010

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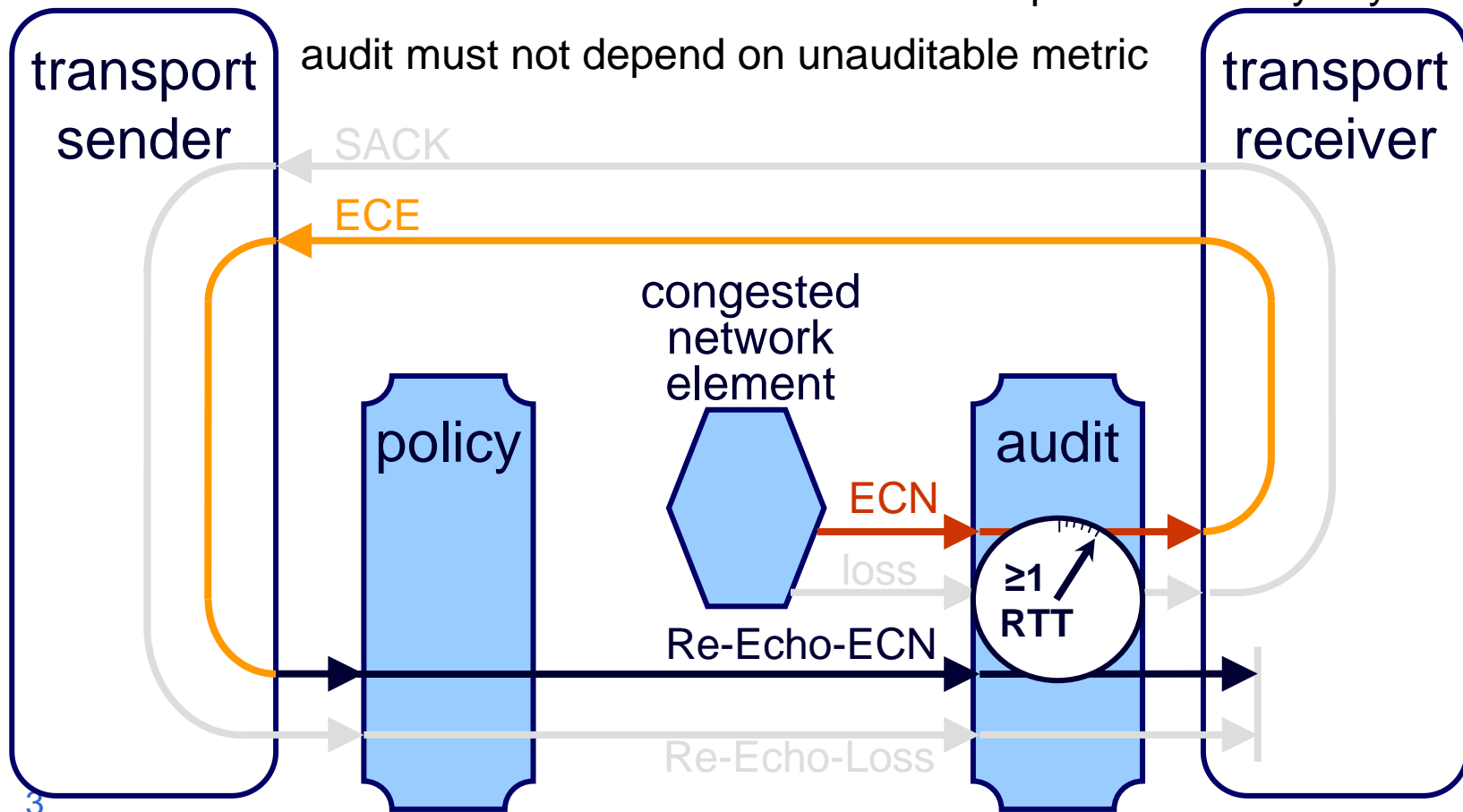
recap: audit function

- ConEx signal from sender (black) can be checked against actual congestion signal (red)



how does audit handle inherent delay?

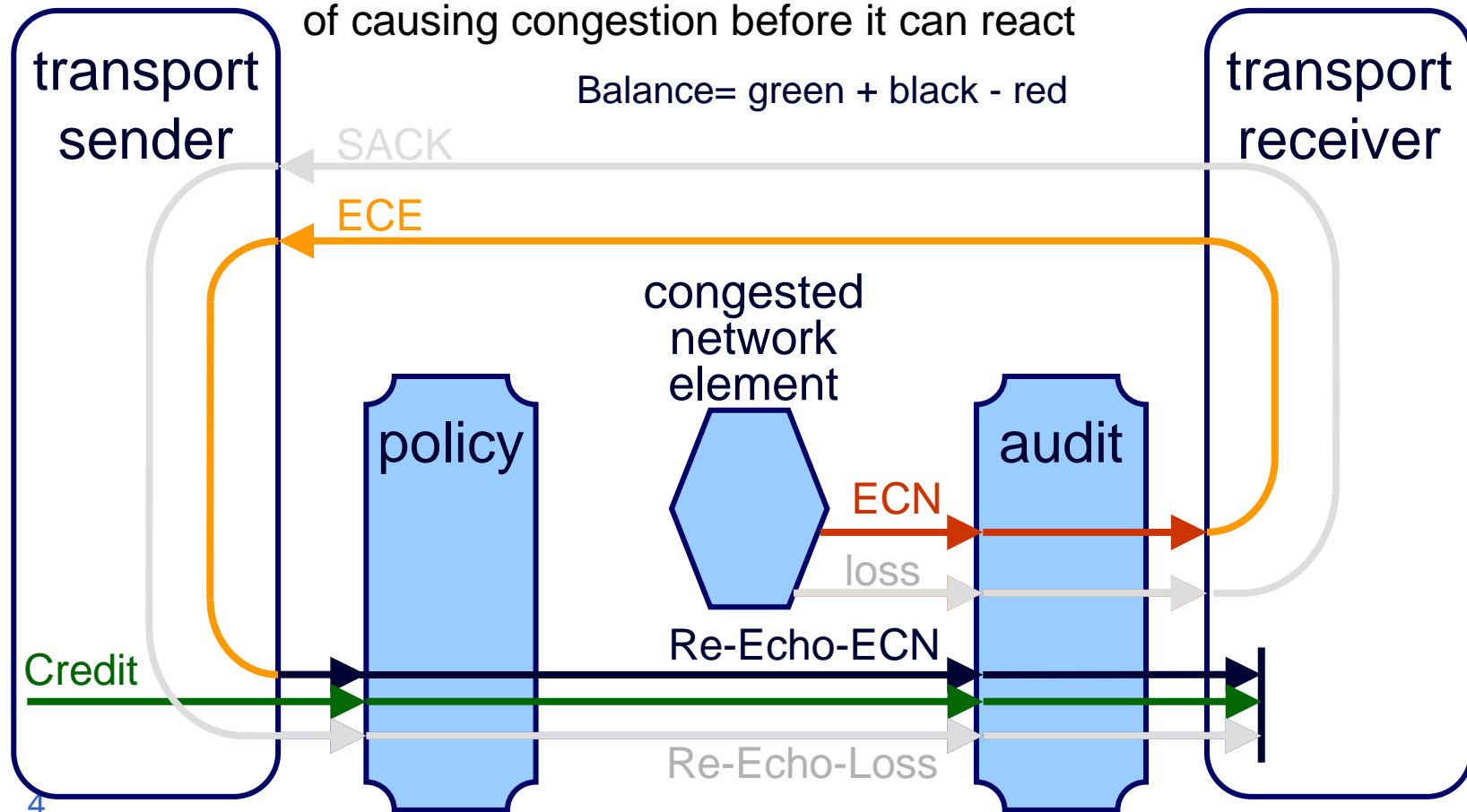
- how long to wait from congestion to re-echo?
 - 1RTT? ~20RTT? ∞ RTT? (TCP, RTCP, FEC)
 - how does a network node know the transport's RTT anyway?



solution

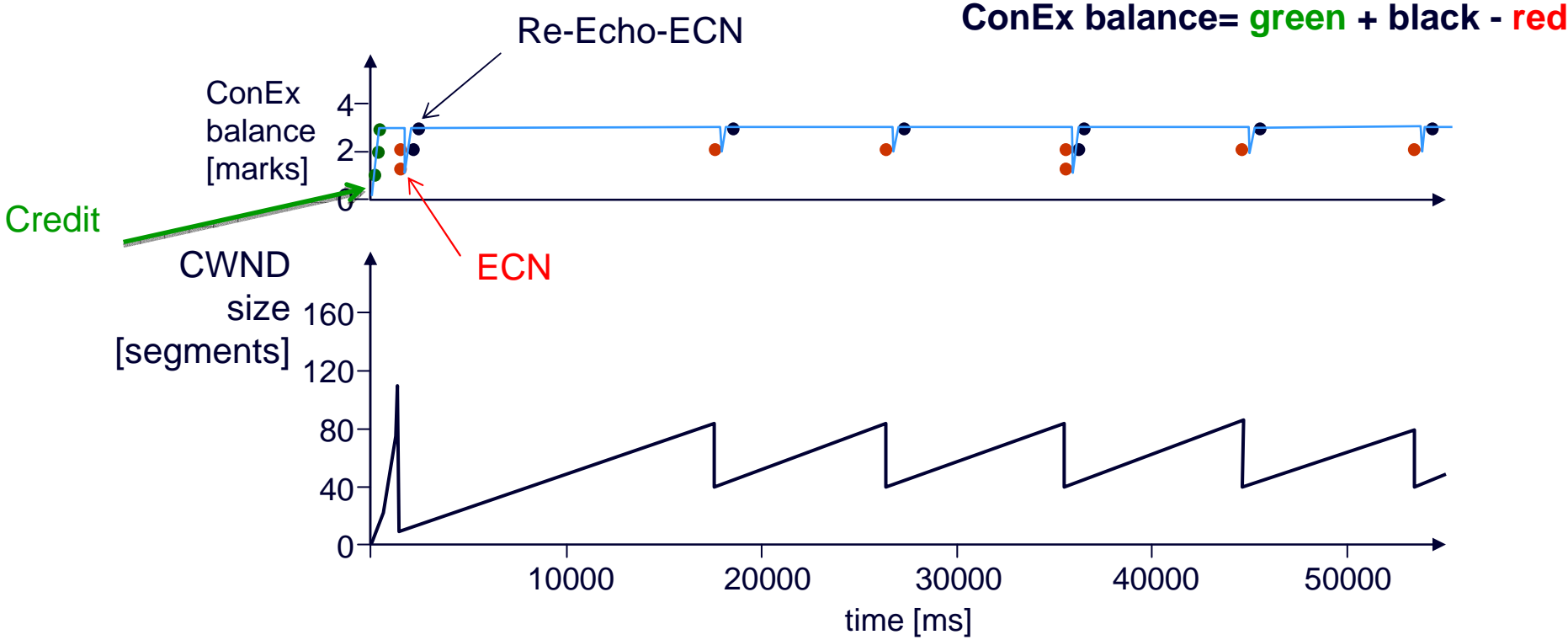
hold transport responsible for delay

- transport must pre-load **Credit (green)** into loop
 - sufficient **Credit (green)** marks for expected congestion during delay
 - makes transport accountable for risk of causing congestion before it can react



ConEx balance of a TCP connection at a audit device

What would a ConEx signal look like?



auditor needs flow state in network ☹️

...but don't forget

- ConEx only needs flow state to check correctness of *information*
- ConEx does not embed rules in the network on how flows *behave* unlike many other traffic management approaches such as:
 - flow-state aware routers
 - deep packet inspection (DPI)
 - and other like this...

Summary

What is a credit signal?

- expectation of the worst congestion that a sender is going to contribute to before it can re-echo
- credit is speculative congestion exposure while re-echo reflects actual
- the number of credit that a sender is going to signal will depend on the aggressiveness of the congestion control it uses
 - create correct incentives not to be aggressive
- This presentation is focused on credit signals for auditing - the signal is also useful in other cases but out of scope here

status & plans

- rationale for Credit signal to be added to draft-01
- normative text on design constraints for audit devices
 - Mathis & Briscoe close to agreeing text to add to draft-01
 - informational, but we don't have a better charter milestone for this
- an audit device design has been implemented
 - resisted various simulated attacks proposed by research community
 - can never prove anything is secure until its broken
 - plan to prepare I-D as a ConEx 'experience report'

ConEx Abstract Protocol

What's the Credit marking for?

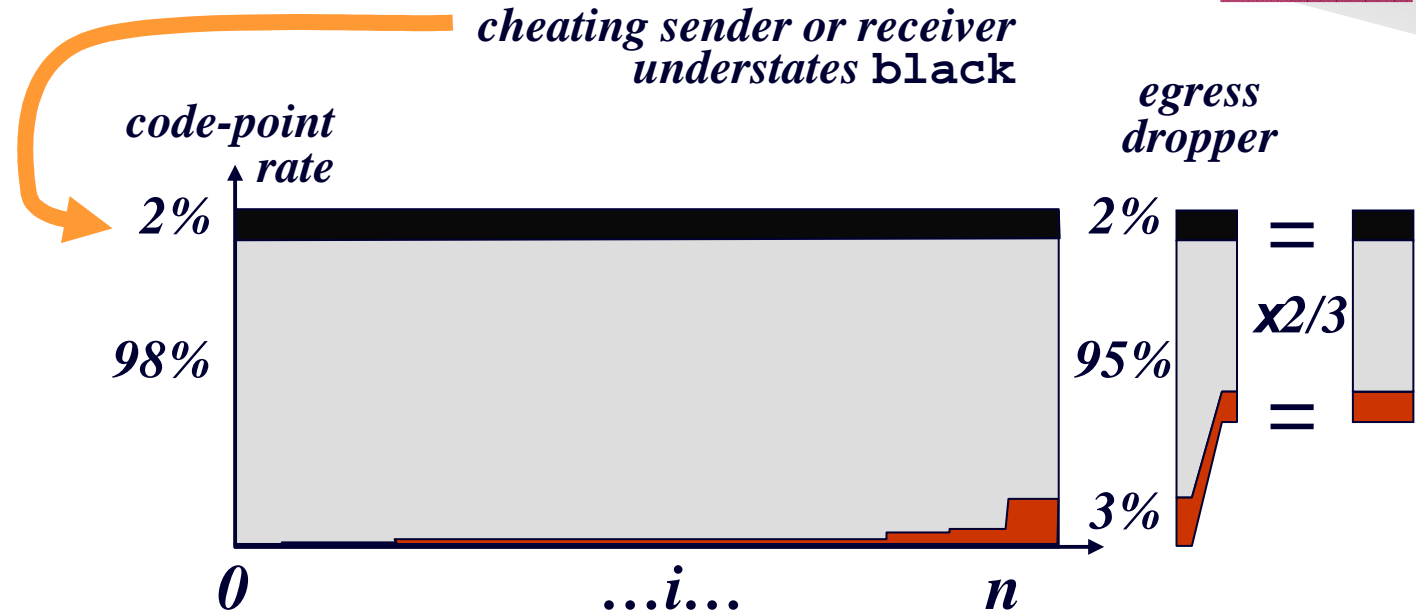
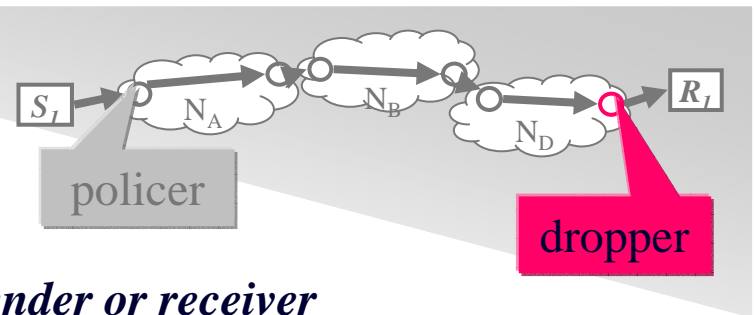
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define 'flow'?

- auditor checks flow 'balance'
 - should be non-negative at any granularity of identifiers
- microflow granularity may not be visible to auditor
 - due to NATs, tunnelling, etc
- can audit at any level of granularity
 - tunnel, src-dst pair, etc
 - if negative balance, go finer if possible
- finer (and closer to destination) always better

egress dropper (sketch)



- drop enough traffic (black immune) to make fraction of **red** = **black**
- goodput best if rcvr & sender honest about feedback & re-feedback

flow bootstrap

- at least one **green** packet(s) at start of flow or after >1sec idle
 - means “feedback not established”
 - ‘credit’ for safety due to lack of feedback
 - a **green** byte is ‘worth’ same as a **black** byte
- a different colour from black
 - distinguishes expected congestion based on experience from based on conservatism
 - gives deterministic flow state mgmt (policers, droppers, firewalls, servers)
 - rate limiting of state set-up
 - congestion control of memory exhaustion
- **green** also serves as state setup bit [Clark, Handley & Greenhalgh]
 - protocol-independent identification of flow state set-up
 - for servers, firewalls, tag switching, etc
 - don’t create state if not set
 - may drop packet if not set but matching state not found
 - firewalls can permit protocol evolution without knowing semantics
 - some validation of encrypted traffic, independent of transport
 - can limit outgoing rate of state setup
- to be precise **green** is ‘idempotent soft-state set-up codepoint’

flow state in network?

three separate reasons for avoiding network flow state

- a) pins flow to path ←not an issue
- b) state attacks ← not an issue
- c) memory cost ←auditingcannot avoid this ☹️

a) auditor's flow state is soft

- if flow moves, ConEx markings recreate state in another auditor

b) auditor requires credit marking before allocating flow state

- ingress policers can then limit influx of credit markings
- flow state exhaustion attacks (incl. SYN attacks) thwarted at source
- servers/firewalls under stress can also prefer new flows with credit marking

c) cannot avoid memory cost

- only need full per-flow auditing once, at egress of internetwork
- clever hardware implementers may design better scaling

discussion

is Credit / Re-Echo distinction worth 2 codepoints?

- for w-g to discuss/decide
 - depends how much space we find for encoding
- more benefits than mentioned so far
 - distinguishes actual vs. speculative congestion exposure
 - useful for bulk monitoring as well as per-flow mechanisms
 - benefits of Credit as a flow state set-up flag
 - hook for e2e session congestion control
 - hook for link layer cut-through optimisations (cf. tag switching)
 - etc