The Benefits to Applications of using Explicit Congestion Notification (ECN)

draft-welzl-ecn-benefits-00

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Reducing Internet Transport Latency

89th IETF Meeting
London, UK
4 March 2014

What are we doing?

- ***Point of draft:***
  - document gains of ECN
  - includes less obvious gains

- ***Out of scope:***
  - To recommend a specific behavior

ECN pro's seem obvious

- "The CE codepoint of an ECN-Capable packet SHOULD only be set if the router would otherwise have dropped the packet as an indication of congestion to the end nodes." [RFC3168]
  - The receiver gets packets instead of loosing them.
  - Benefits shown in [RFC 2884], are not always biggest gain
  - In light to moderately loaded networks, number of dropped packets dropped due to congestion is small [RFC 3649]
  - …but that's ***only a part of the story***

(Note: some but not all of ECN's benefits need a different configuration than RFC 3168's "SHOULD" above)

Benefit from avoiding congestion loss

- Reduced ***Head-of-Line Blocking***
  - Relevant for transports providing in-order delivery
- TCP/SCTP: Reduced ***Probability of RTO Expiry***
  - RTO collapses cwnd, with significant bad impact; several mechanisms try to prevent this
- Some applications do not retransmit ***lost packets***
  - Typically VoIP, interactive video, real-time data
  - Need to apply loss-hiding mechanisms, with immediate effect on user-perceived quality

Benefits that require special configuration

- If ECN is configured such that routers mark packets at a lower level of congestion before they would otherwise drop packets from queue overflow:
  - Can avoid capacity overshoot; relevant e.g. in Slow Start
  - Can make congestion visible; relevant in ConEx

- If a special configuration *and* reaction are used:
  - E.g. DCTCP has shown benefits when:
    - packets are marked earlier than they would otherwise be dropped
    - an instantaneous (= not averaged) queue is used for this decision (can be achieved with a special configuration of RED)
    - Receiver precisely feeds back number of ECN marks received in an RTT

Conclusion

- Motivates people configuring host stacks and network devices to enable ECN.
- Application developers should where possible use transports that enable ECN.
- Once enabled, the benefits of ECN are provided by the transport layer and the application does not need to be rewritten to gain these benefits.

Next Steps

- Is a document of this type helpful?
- Are there *other* benefits to list?
- Do we need to explain (potential) *problems*?