ConEx Specification for Modification to TCP

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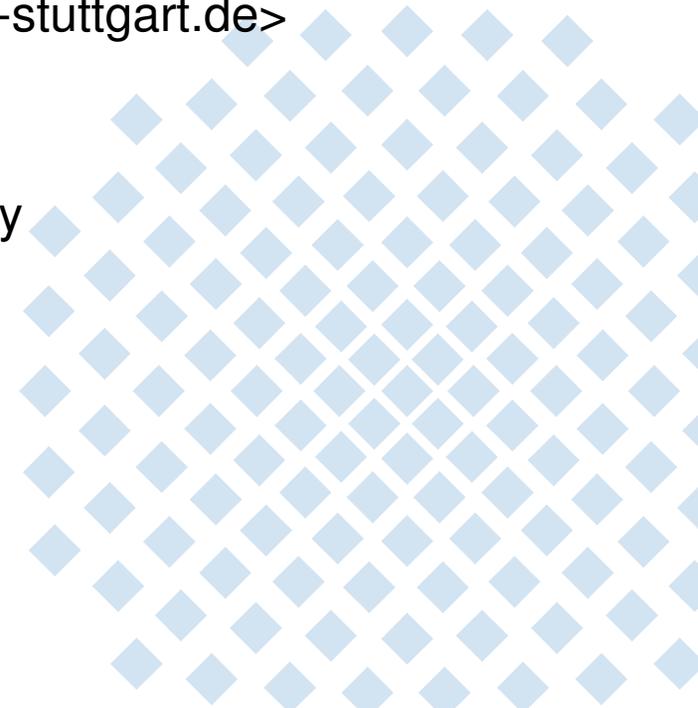
Outline: ToC of the up-coming I-D

TCP Handshake Negotiation (1)

Bytes 13 and 14 of the TCP Header:

```
     0   1   2   3   4   5   6   7   8   9  10  11  12  13  14  15

   +---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
   |               |           | N | C | E | U | A | P | R | S | F |
   | Header Length | Reserved  | S | W | C | R | C | S | S | Y | I |
   |               |           |   | R | E | G | K | H | T | N | N |
   +---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
```
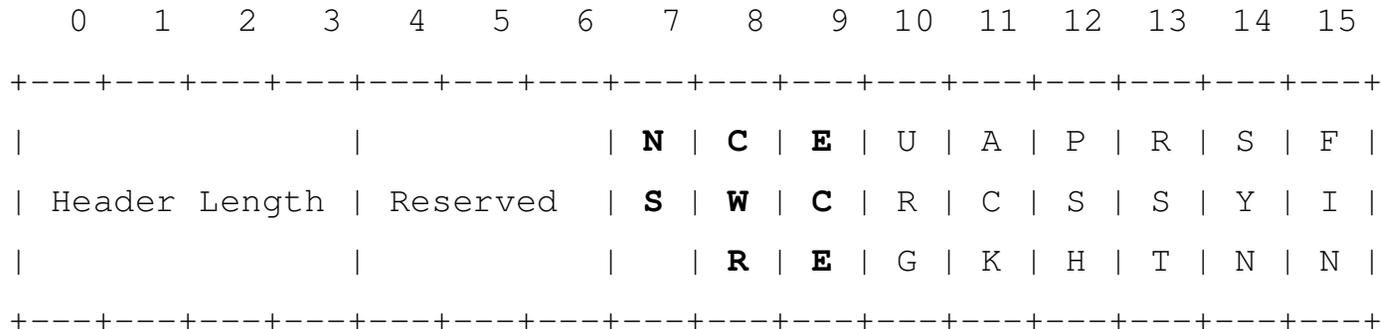
SYN: Use TCP NS = 1 (ECN Nonce bit) to indicate ConEx support

– MUST/SHOULD request ECN support as well: `NS = CWR = ECE = 1`

SYN/ACK: Receiver is ConEx enable set CWR: `CWR = 1, ECE = 0`

– NS bit can be used to signal congestion information of SYN (if SYN ECN-enabled)
– CWR = ECE = 1 should not be used because buggy receiver might just echo SYN bits
– Otherwise receiver replies as specified for ECN: `CWR = 0, ECE = 1 or CWR = ECE =0`
→ 3 ConEx modes: Receiver is **ConEx-enabled** or just **ECN-enabled** or **none** of both

- No changes to ECN (RFC 3168: The Adoption of ECN to IP)
- No support of ECN Nonce (RFC 3540: Robust ECN Signaling with Nonces)

TCP Handshake Negotiation (2)

ConEx	Nonce	ECN	-	SYN A-B NS CWR ECE	SYN ACK B-A NS CWR ECE	A-B Mode	B-A Mode
AB				1 1 1	X 1 0	ConEx	ConEx
A	B			1 1 1	1 0 1	ECN-Co	ECT-Nonce
A		B		1 1 1	0 0 1	ECN-Co	ECT
A			B	1 1 1	0 0 0	Sender-only	Not-ECT

Questions

- Should ConEx be bundled with ECN capability at the sender? Or is there a case for a request for drop-only ConEx?

- Should ConEx always set SACK-Permitted Option in SYN (RFC 2018)?

- Use of NS in SYN/ACK? Enable ECN on SYN (with different coding) to avoid SYN packet drops?

- Middlebox issues?

Sender Modification

- Set ConEx bits in IP header (based on selected coding scheme in IPv6 draft)
- Monitor number of drops; number of ECN markings from receiver feedback (depending on mode)
- No modifications to TCP congestion control (required)

Questions

- Credit signal processing mandatory or just recommended?
- Handling of pure ACKS, retransmissions, window probes...?
- Should these related questions be discussed in this draft?
  - Requirements for dropper design based on credit processing + related security considerations
  - Congestion control/management

Receiver (Optional Modifications)

Changes only needed if receiver is ConEx enabled

- Monitor number of ECN markings

- Signal total number of ECN-markings to sender in TCP header of ACK

  - RFC 3168 (The Addition of ECN to IP): Receiver sets the ECE bit in every packet after observing a CE mark form the network until a data packet with the CWR bit set is received

    → Not more than one ECN congestion signal per RTT

  - Give feedback on all observed ECN-markings & be robust against loss of ACKs

  - Different mechanism for feedback encoding needed (by using the **NS**, **CWR** and **ECE** bit)

Question

- How encode ECN feedback in the ACK ?

  - Max. number of two feedback markings per ACK (delayed ACKs -> RFC 2158: TCP Congestion Control)?

  → 3-bit counter (internal counter for the total number of seen CE markings, proposed by re-ECN to encode counter value modulo 8)

  → Signal additional number of ECN markings + ACK loss detection

  → Some kind of redundancy (sending the same information in subsequent ACKs)...

  → Other proposals???