Spurious Retransmission Detection (SRD) with the TCP Echo Options

draft-zimmermann-tcpm-spurious-rxmit

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Problem Statement

- **Eifel detection**
  - Uses TCP Timestamp options [RFC 7323] to detect spurious retransmissions
  - Limited applicability due to TSecr semantics, and TSval granularity
  - No detection of reordering during loss recovery

- **Idea: Make every segment – including all retransmissions – uniquely identifiable (to the sender)**
  - Allows all functionality of Eifel, even during corner cases
  - Enables new capabilities (lost retransmission detection)

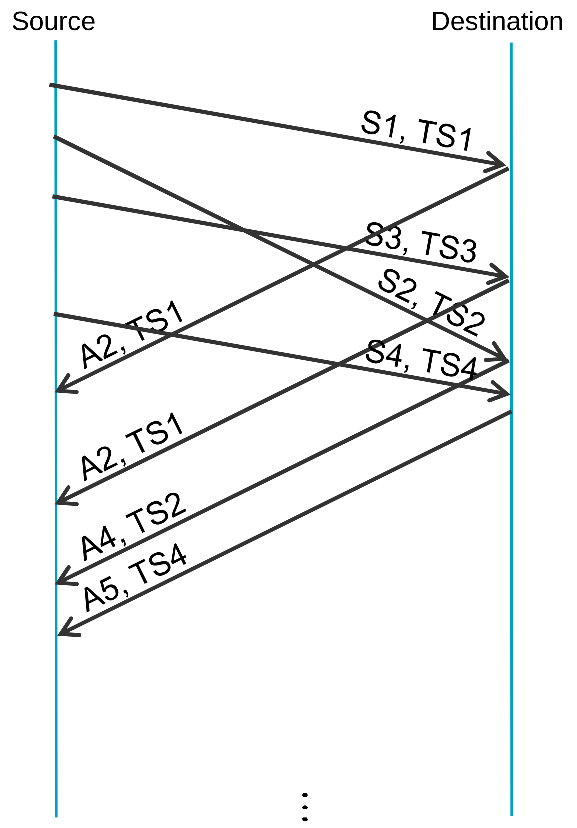
Spurious Retransmission Detection (SRD)

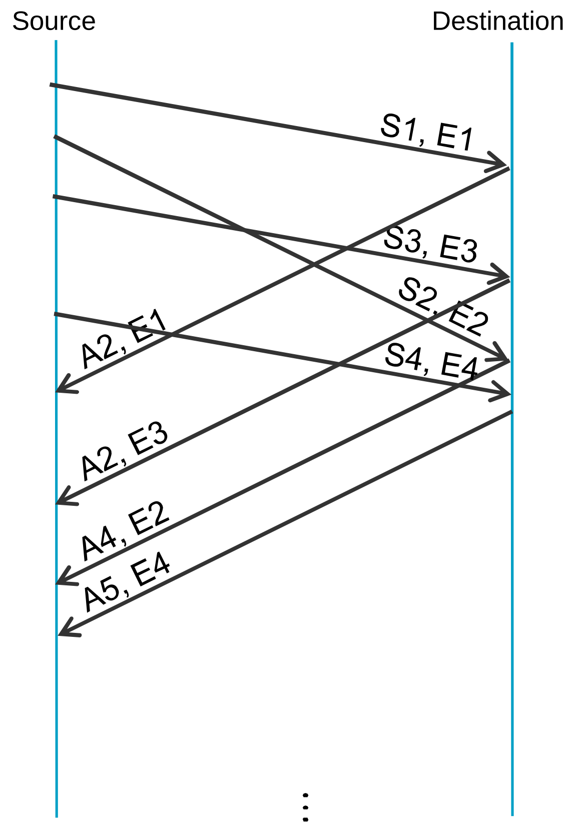
- **Mechanism**
  - Use TCP Echo Option to send a (small) counter in each segment to keep MSS equal for retransmissions
  - Increase counter when sending a new round of retransmissions e.g. (re-)entering loss recovery
  - Check counter in received ACK
    - Equal to current value → valid retransmission
    - Else spurious retransmissions

- **Property**
  - Semantics of TCP Echo allows to determine the exact ordering of transmissions, even in case of reordering

Example (Semantics)

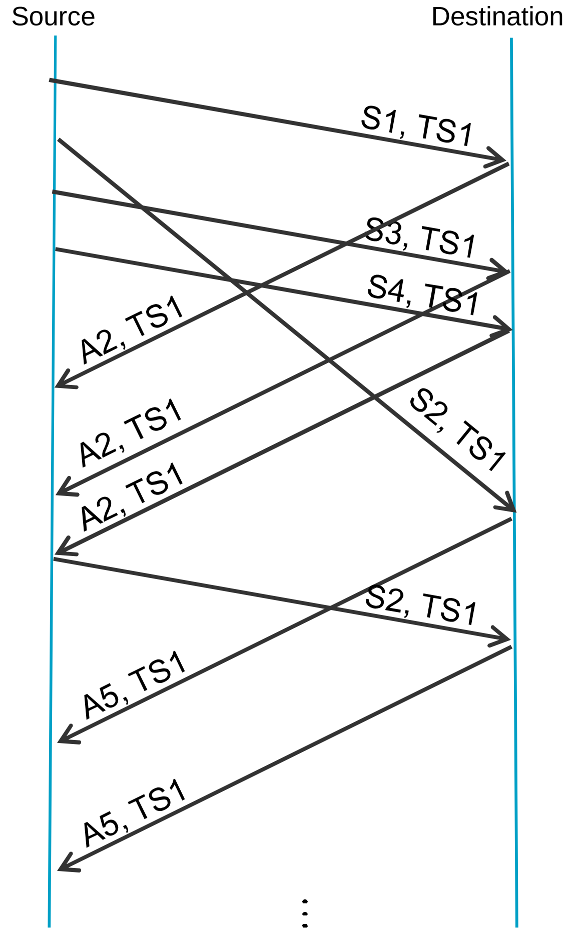
- RFC7323 TSecr reflects TS of last in-sequence segment

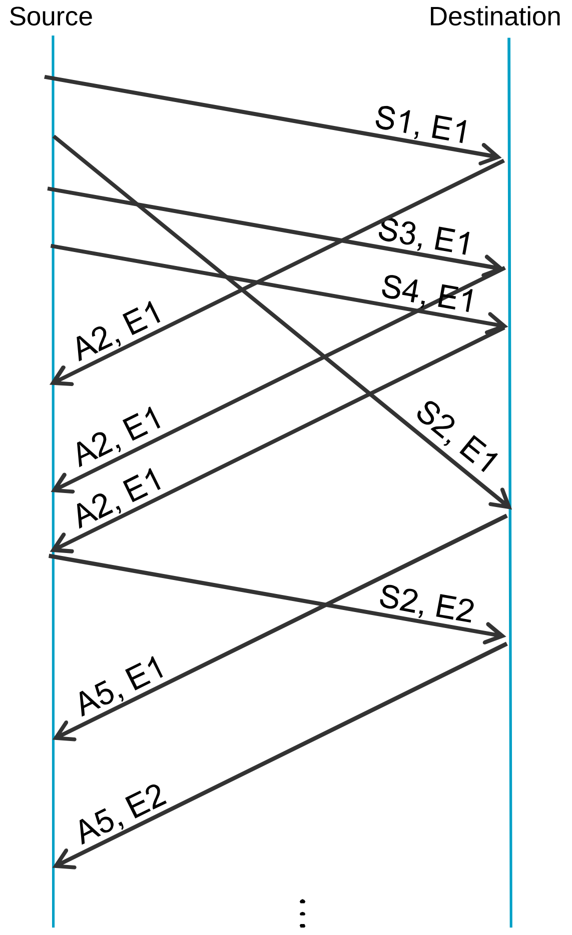




Example (Eifel vs. SRD)

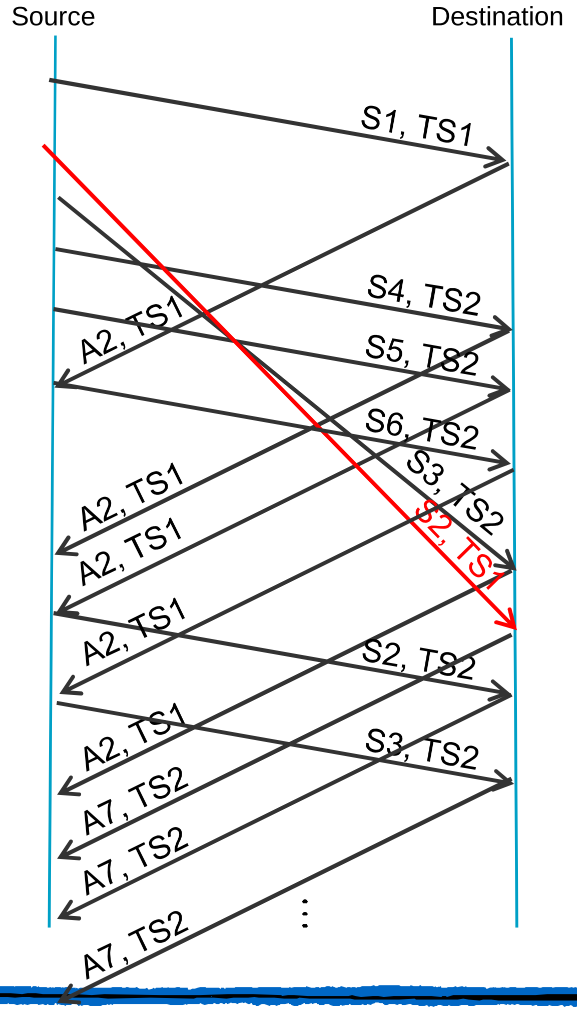
- Granularity of TS often too coarse

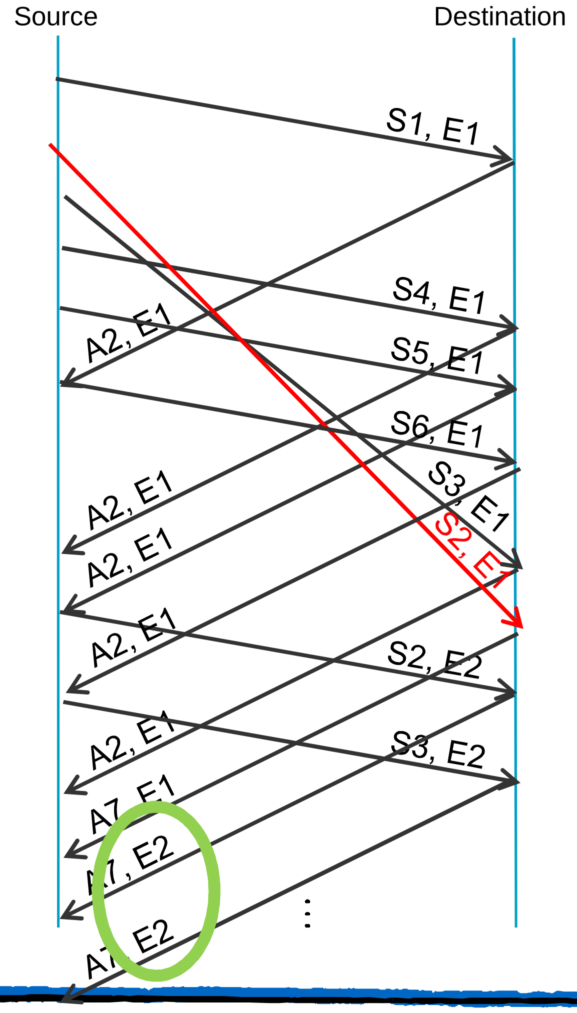




Example (Eifel vs. SRD)

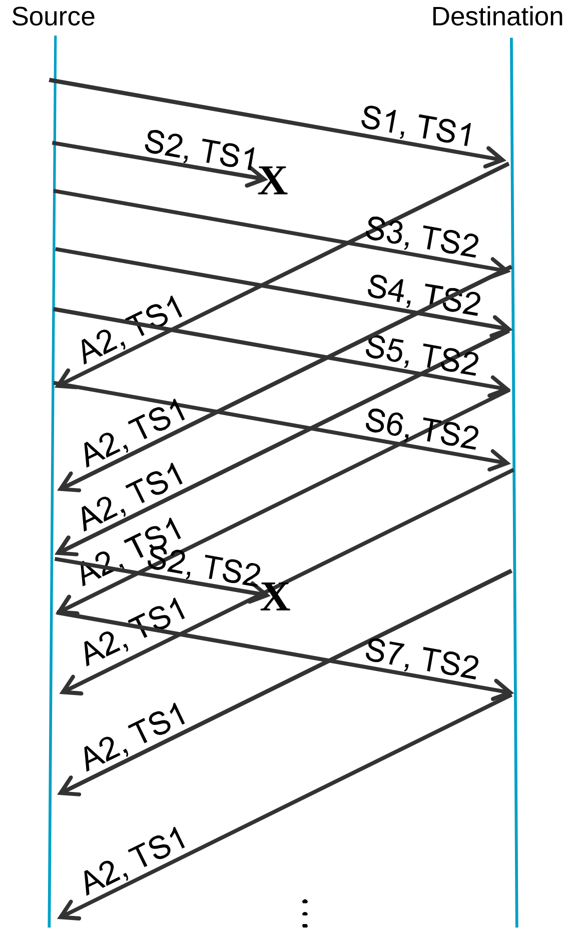
- Eifel only works on first retransmitted segment

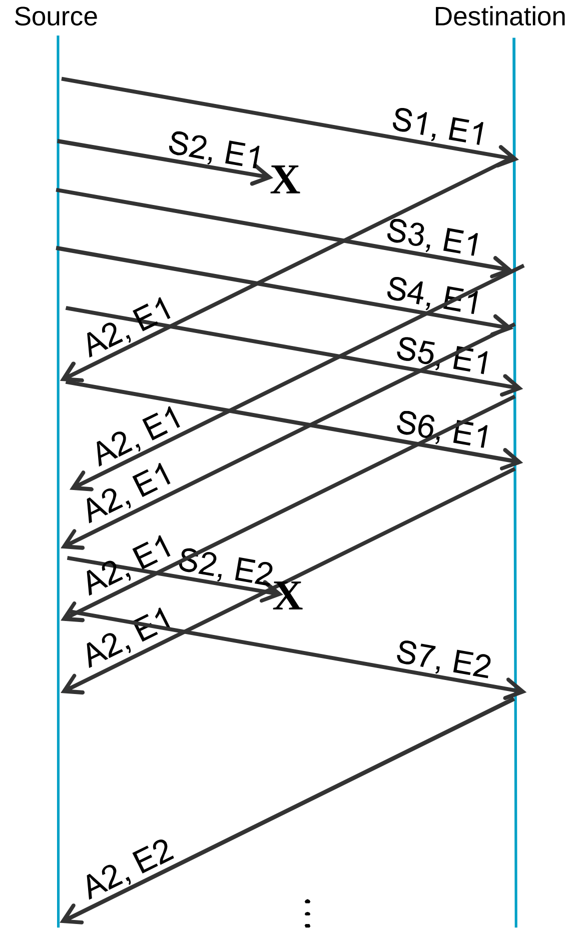




Example (Eifel vs. SRD)

- Allows lost retransmission detection





Moving forward…

- **Less overhead than RFC7323 Timestamps**
- **Solves the retransmission ambiguity problem completely**
  - More Complex scenarios involving Fwd Loss / Fwd Reordering / ACK Loss / ACK Reordering
  - Enables Lost Retransmission Detection (LRD) while strictly adhering to packet conservation principles
  - QUIC has similar “control sequence number”
- **Next steps**
  - Received initial feedback (clarifications)
  - Eventually asking for adoption