# On The Passive Measurability of QUIC

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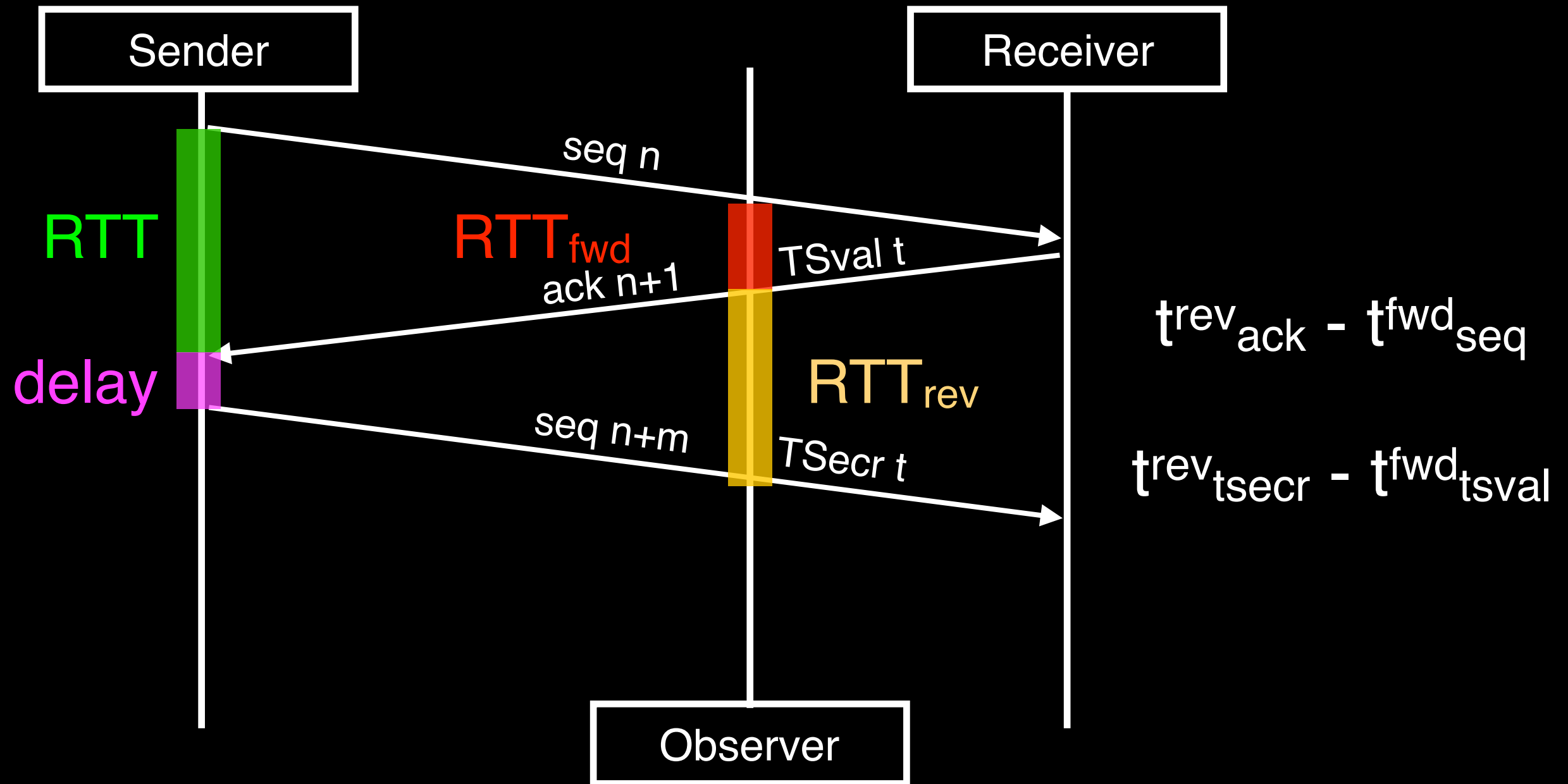RIPE 75 Plenary, 22 October 2017

# QUIC in review

- UDP-encapsulated transport protocol being standardized by the IETF.

    - Rolled out by Google since 2014: 35% of Google traffic, 7% of Internet traffic.

- Designed for deployability, evolvability, low-latency, and security.

- Initial focus on support for HTTP/2, but is a new, general-purpose Layer 4 protocol.
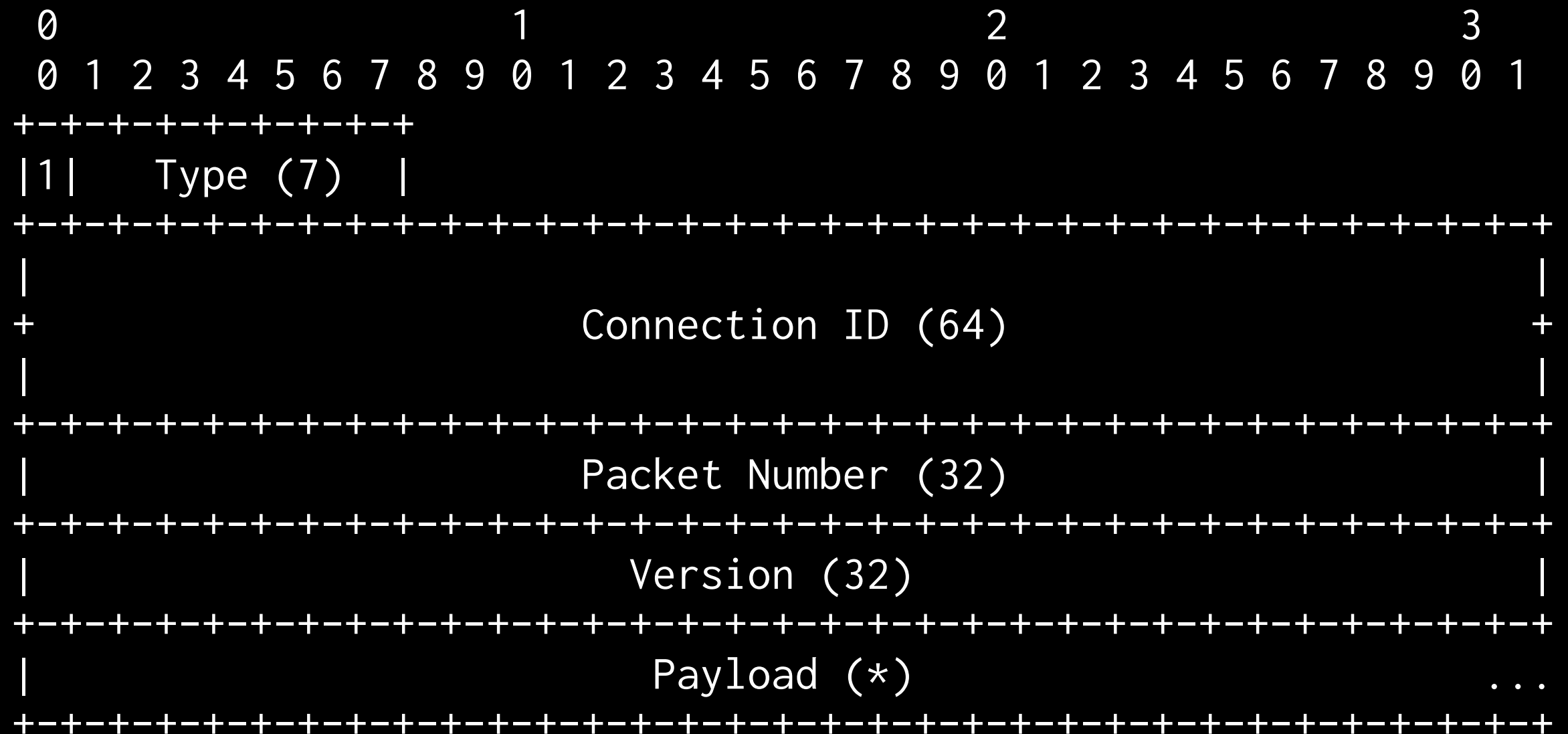
# What's up and why should I care?

- TCP continuously radiates information about loss and RTT to passive observers along the path.

  - Loss and RTT measurement useful for intra- and inter-network health monitoring and troubleshooting.

- QUIC (as presently defined) doesn't do this.

  - So no passive performance measurement of QUIC on your network.

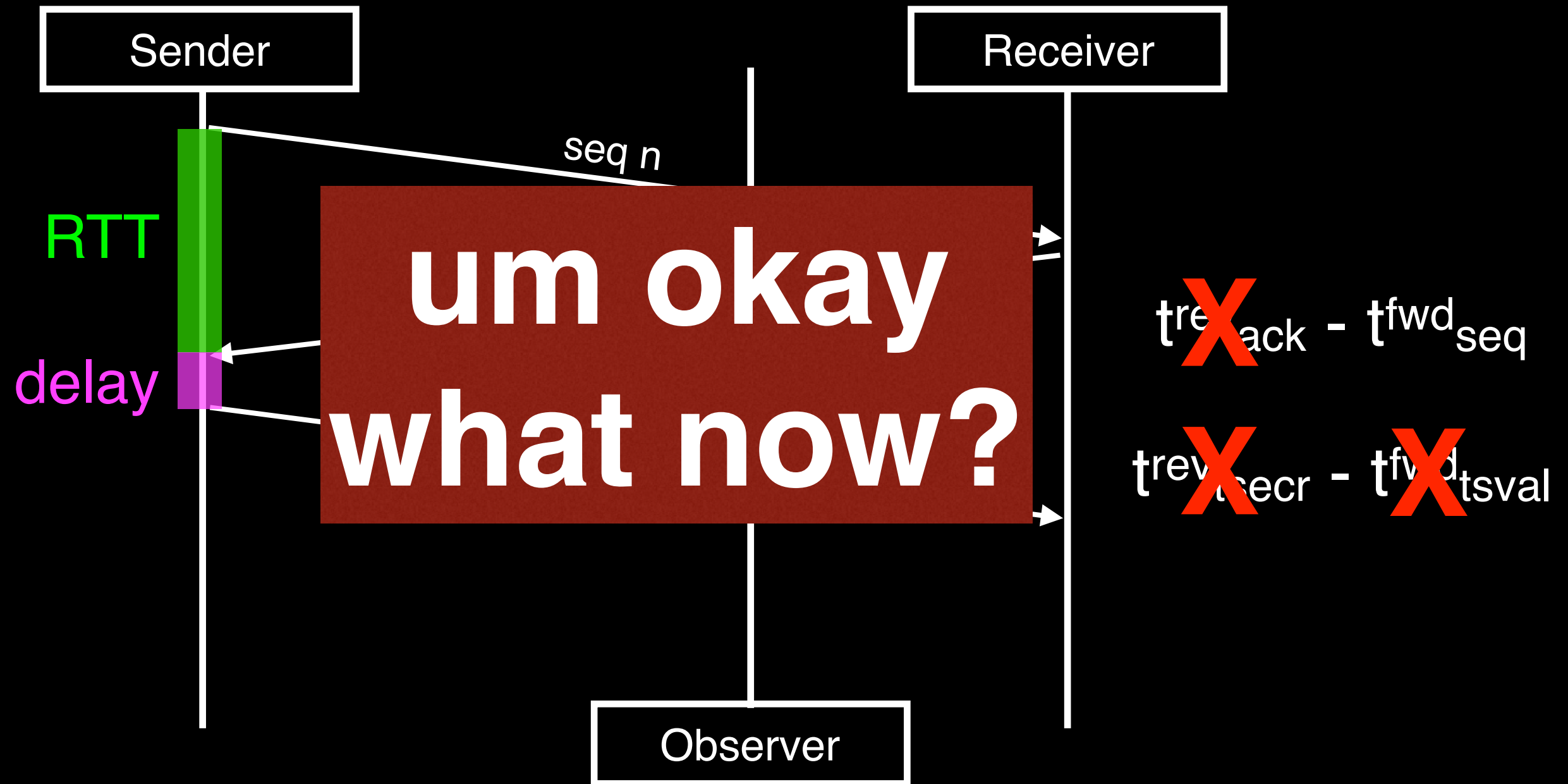  - Is this a problem?

# Back to TCP School: Passive RTT Measurement

Sender

Receiver

seq n

RTT

$RTT_{fwd}$

TSval t

ack n+1

delay

$RTT_{rev}$

seq n+m

TSecr t

$t^{rev}_{ack} - t^{fwd}_{seq}$

$t^{rev}_{tsecr} - t^{fwd}_{tsval}$

Observer

# QUIC packet header

```
 0                   1                   2                   3
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+
|1|   Type (7)  |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                                                               |
+                     Connection ID (64)                        +
|                                                               |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                     Packet Number (32)                        |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                        Version (32)                           |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                        Payload (*)                         ...
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

# Matching packets with QUIC

Sender

Receiver

*seq n*

RTT

delay

**um okay what now?**

$t^{rev}_{ack} - t^{fwd}_{seq}$ ✗

$t^{rev}_{tsecr} - t^{fwd}_{tsval}$ ✗ ✗

Observer

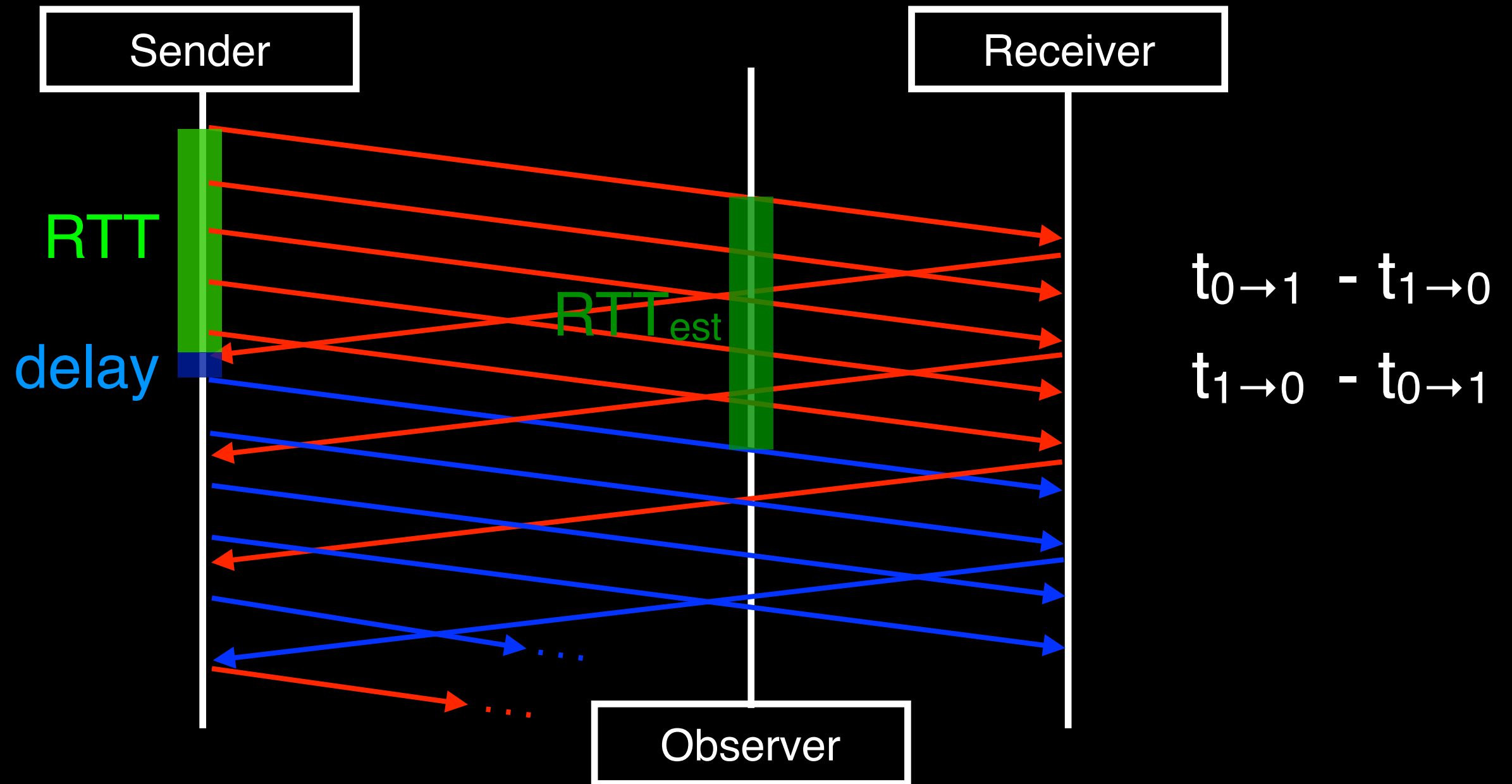# Why encrypt SEQ/ACK/TS?

- A **minimal wire image** is a design goal of QUIC:
  - Defense against "collect it all" is "encrypt it all"
  - Every bit we put on the wire is a bit
    we won't be able to change in the future.
  - Every bit we put on the wire is a bit
    that might be used against us in the future.

# Explicit passive measurability of RTT

- If passive measurability of a protocol is a desirable feature, then it should be explicitly supported by the design of the protocol.

- Is there a way to do this with a minimal impact on the wire image?

# The Latency Spin Bit



$t_{0\rightarrow1} - t_{1\rightarrow0}$

$t_{1\rightarrow0} - t_{0\rightarrow1}$

see https://github.com/quicwg/base-drafts/pull/609

# We need your input

- Do you presently use, or do you plan to use, passive RTT measurement on your network?

- IETF QUIC WG has appointed a design team to weigh utility v. risks, will (hopefully) come to conclusion at IETF 100 in Singapore in November.

- Come talk to me,
  or send mail to <ietf@trammell.ch>