



SharkFest '17 Europe

Transmission Control Protocol Illustrated:

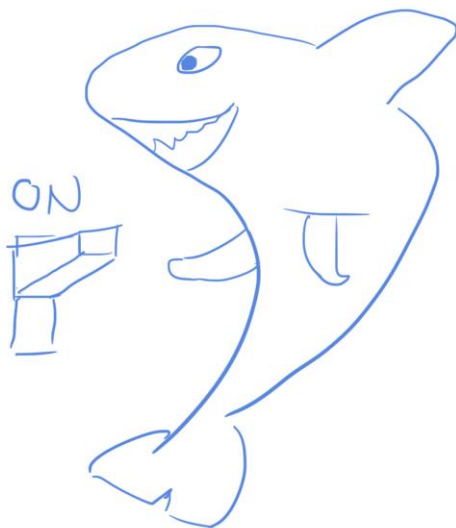
everything you always wanted to
know about TCP*
(*but were afraid to ask)

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FINS
THIS IS A ~~HANDS~~-ON !





PCAPs

https://www.dropbox.com/s/wfarn3dfp5ro3dc/14_TCP_Illustrated_SF17EU.zip?dl=0





SEQ #



SYN | FIN

01_TCP_SYN_FIN.pcapng





Zero Window

04_TCP_zero_window_fast_retransmit.pcapng





Dup ACKs!1!

04_TCP_zero_window_fast_retransmit.pcapng





Window Size ~108k
1460 bytes MSS
→ ~74 packets in flight
→ ~74 Dup ACKS





Bandwidth \cong Throughput ?

05_TCP_WS_RTT1.pcapng



Bandwidth Delay Product

Receive Buffer (max WS) / RTT



theory:

1MB WS / 0.123s → ~68MBit/s

practice:

40kB WS / 0.123s → ~2.6MBit/s



Receive Buffer FTW ?

06_TCP_WS_RTT2.pcapng





theory:

4MB WS / 0.115s → ~292MBit/s

practice:

525kB WS / 0.115s → ~36.5MBit/s





Perfect ?

07_TCP_WS_RTT3.pcapng



slow start ruining it all



Keep Alive

03_TCP_keep_alive.pcapng



RFC793bis

<https://tools.ietf.org/html/draft-ietf-tcpm-rfc793bis-06>



Questions?

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Size ?

02_TCP_sequence_number.pcapng



4 bytes field → ~4 GB payload

1 Gbit/s \approx 33 sec

10 Gbit/s \approx 3.5 sec