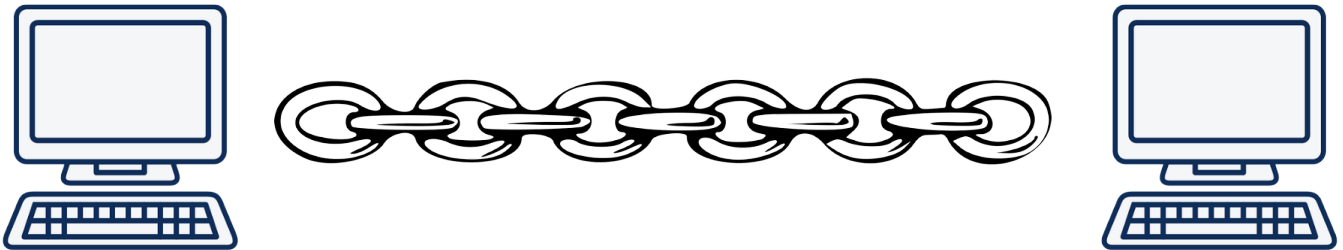


HTTP/3 explained

TCP head of line blocking

TCP head of line blocking

HTTP/2 is done over TCP and with much fewer TCP connections than when using earlier HTTP versions. TCP is a protocol for reliable transfers and you can basically think of it as an imaginary chain between two machines. What is being put out on the network in one end will end up in the other end, in the same order - eventually. (Or the connection breaks.)

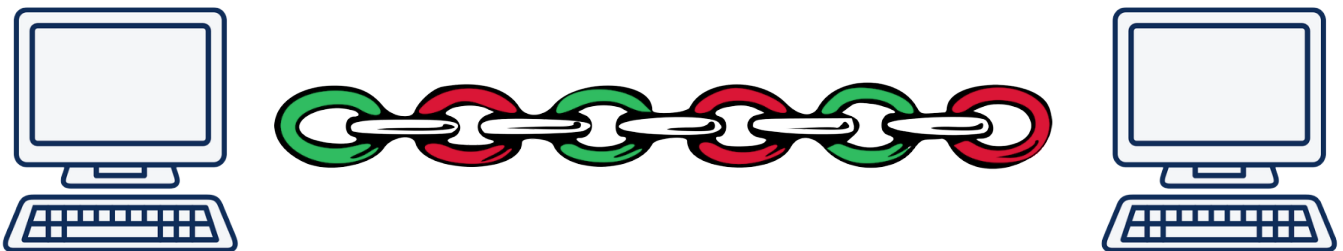


a TCP chain between two computers

With HTTP/2, typical browsers do tens or hundreds of parallel transfers over a single TCP connection.

If a single packet is dropped, or lost in the network somewhere between two endpoints that speak HTTP/2, it means the entire TCP connection is brought to a halt while the lost packet is re-transmitted and finds its way to the destination. Since TCP is this "chain", it means that if one link is suddenly missing, everything that would come after the lost link needs to wait.

An illustration using the chain metaphor when sending two streams over this connection. A red stream and a green stream:



the chain showing links in different colors

It becomes a TCP-based head of line block!

As the packet loss rate increases, HTTP/2 performs less and less well. At 2% packet loss (which is a terrible network quality, mind you), tests have proven that HTTP/1 users are usually better off - because they typically have up to six TCP connections to distribute lost packets over. This means for every lost packet the other connections can still continue.

Fixing this issue is not easy, if at all possible, with TCP.

Independent streams avoids the block

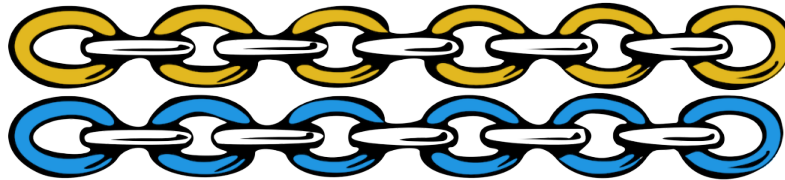
With QUIC there is still a connection setup between the two end-points that makes the connection secure and the data delivery reliable.



a QUIC chain between two computers

When setting up two different streams over this connection, they are treated independently so that if any link goes missing for one of the streams, only that stream, that particular chain, has to pause and wait for the missing link to get retransmitted.

Illustrated here with one yellow and one blue stream sent between two end-points.



two QUIC streams between two computers