Protocol Deep Dive: QUIC

An Introduction to QUIC

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QUIC – The TCP Killer?

QUIC (not an acronym) is a general-purpose, reliable transport protocol for web and other applications – over UDP.

In short – designed to accelerate web application delivery and make it more secure.

IEEE Draft-IETF-QUIC-Transport-34

Who Uses QUIC?

Google

YouTube

Network Engineers

DevOps

SecOps

App Developers

Module Overview

Why Replace TCP?

QUIC Fundamentals

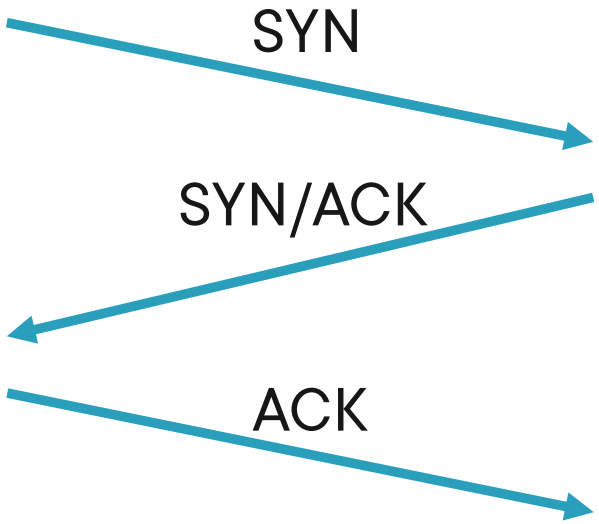
- **The History of QUIC**
- **The QUIC Protocol Stack**
- **How is QUIC Secured?**

QUIC – The Pathway to HTTP/3

Hands-On with Wireshark and QUIC

Why Replace TCP?

The Transmission Control Protocol



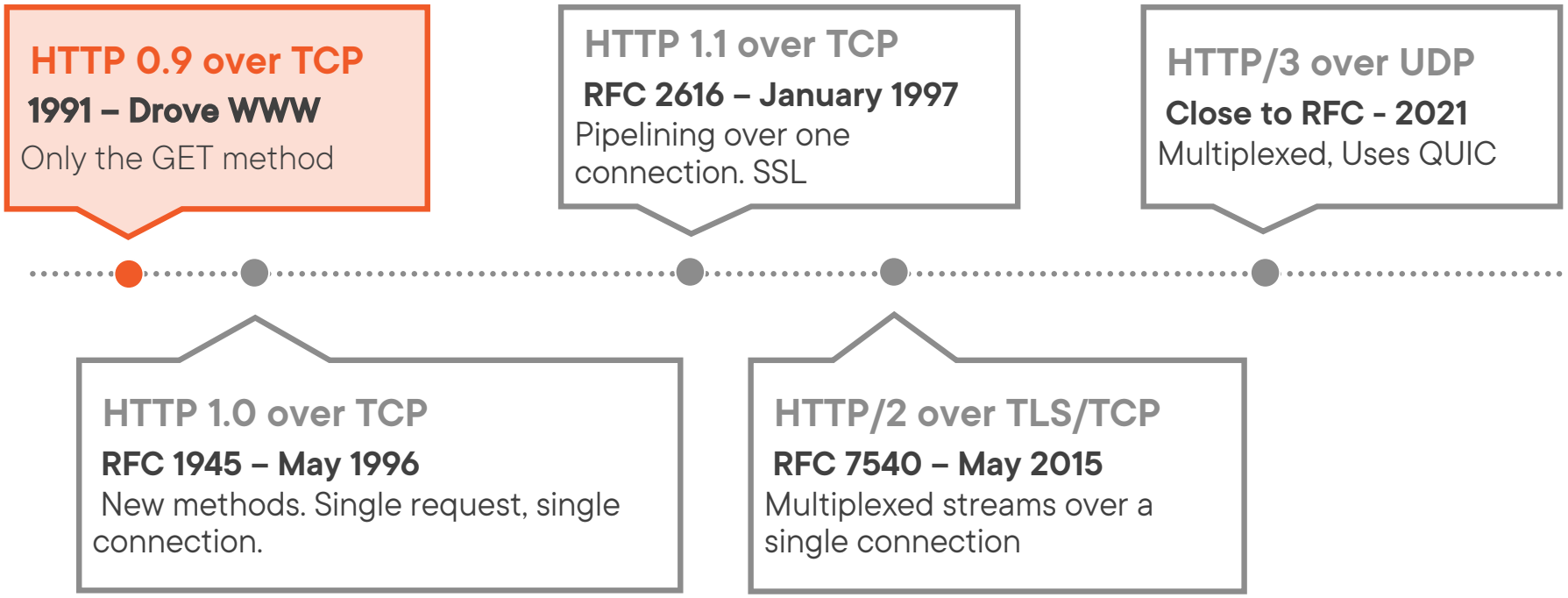
RFC 793 – September 1981

- **Improvements in options since**
- **Congestion Control Algorithms**

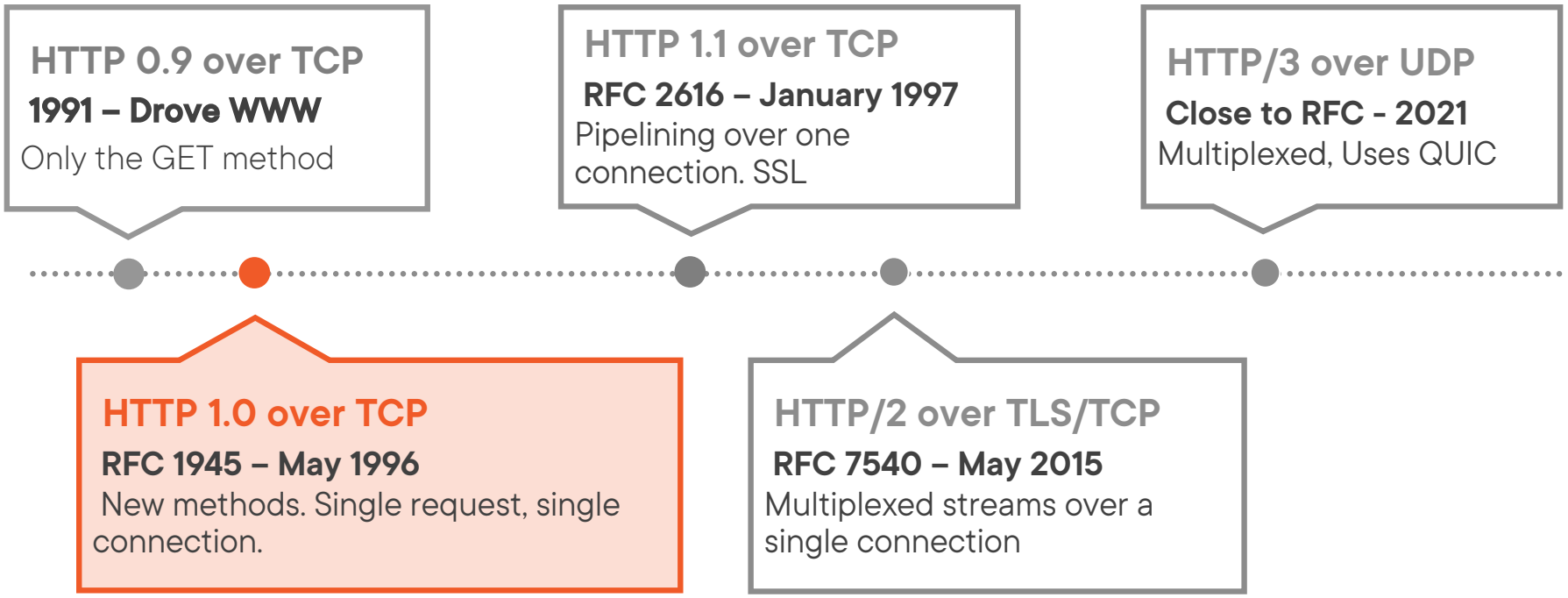
Reliable, connection-oriented

Used to carry most application traffic in the world.

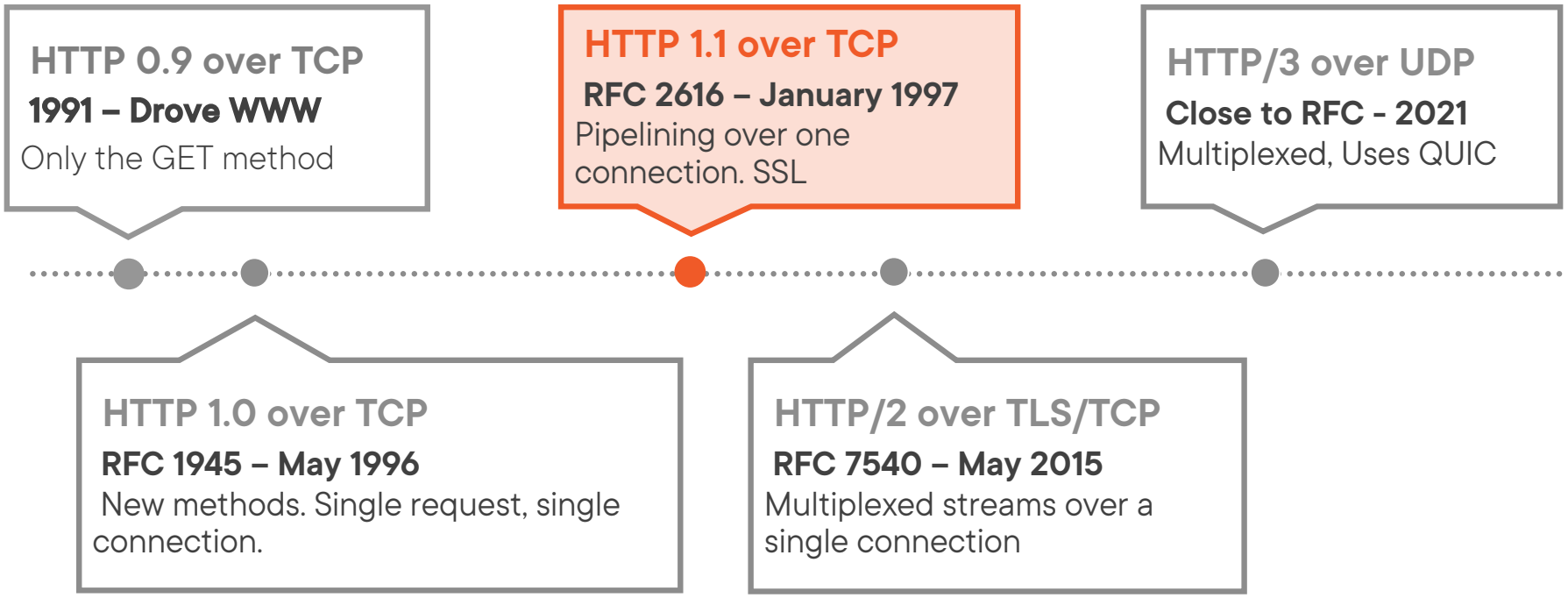
The Web Over TCP



The Web Over TCP



The Web Over TCP



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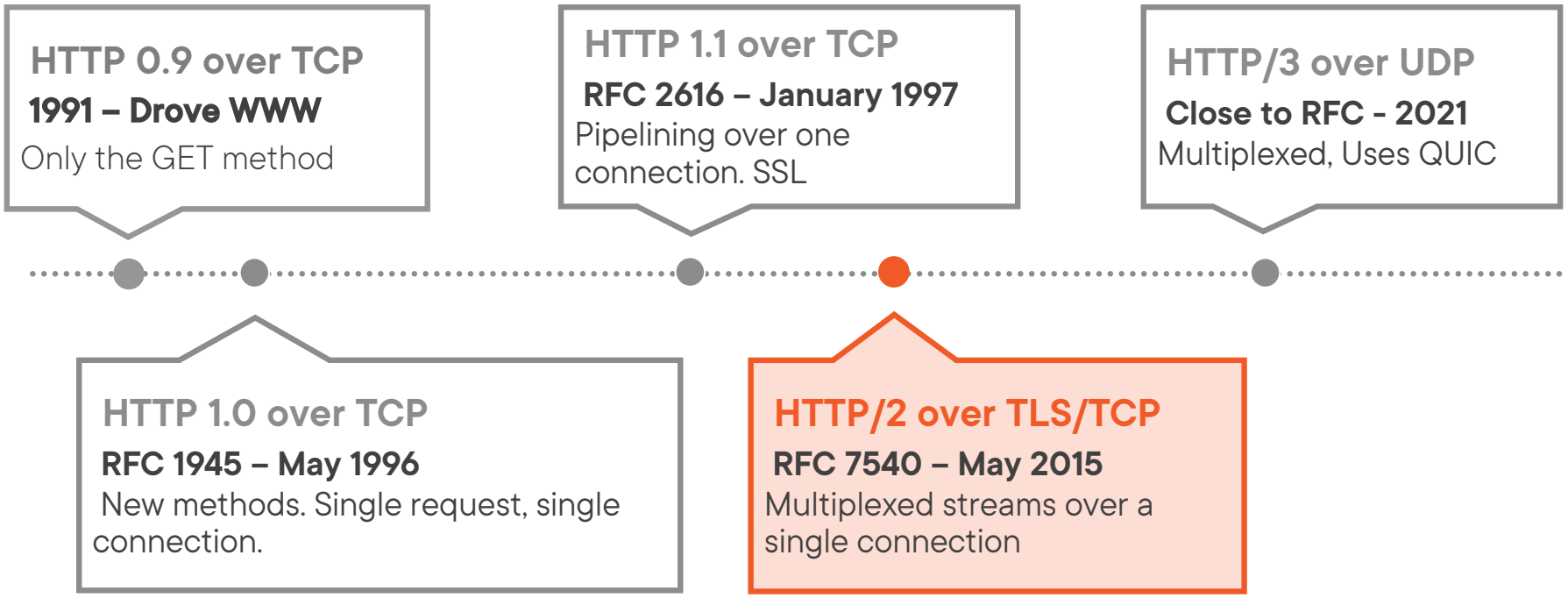
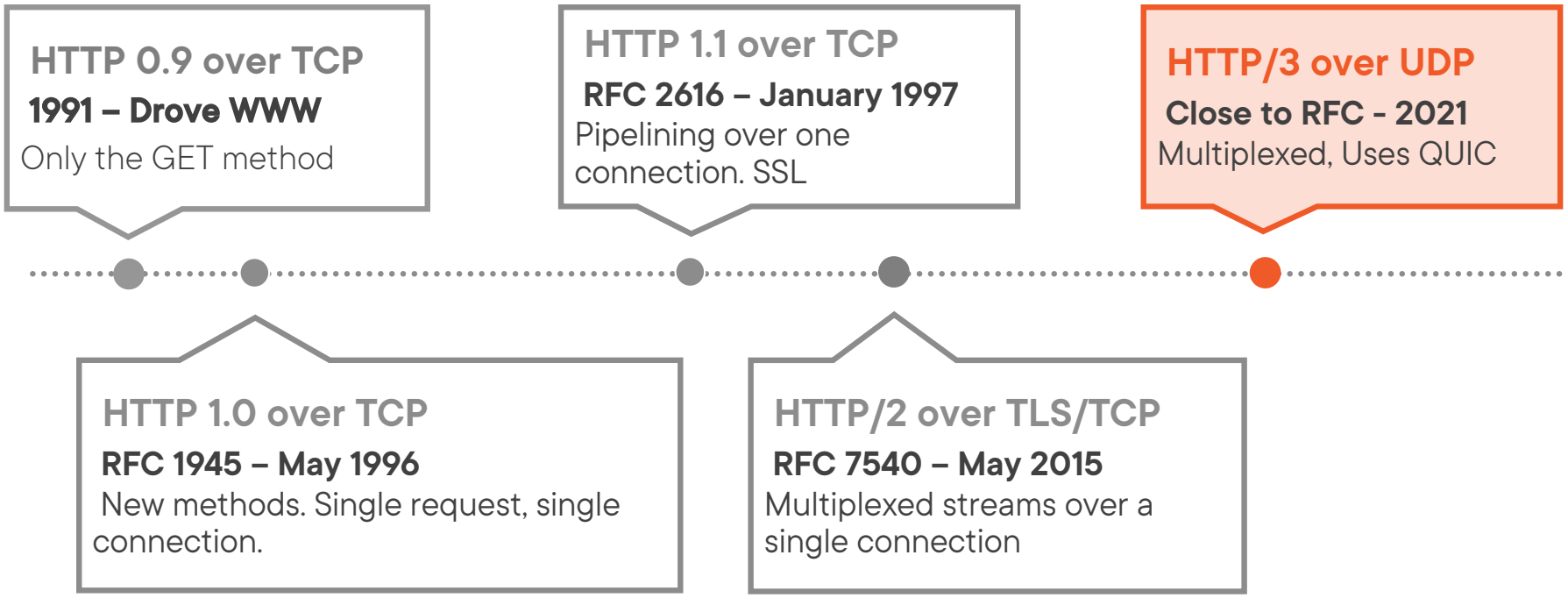


The Web Over TCP



Why Replace TCP?

It's time to move on for the web.

Limited Room to Change

Not much room in header. Network adjusts all it can.

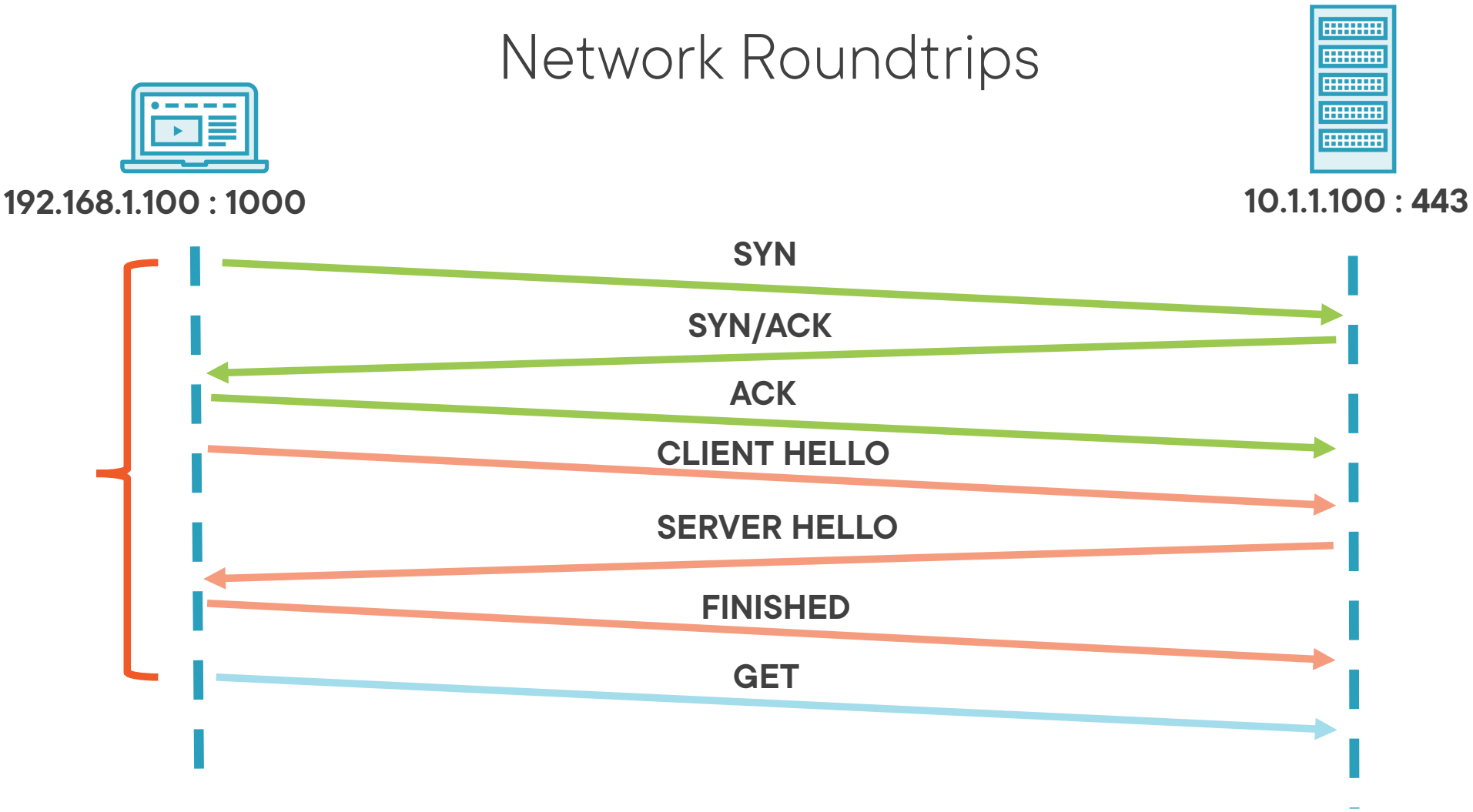
Head of line blocking

Each connection is single stream, loss causes bottleneck

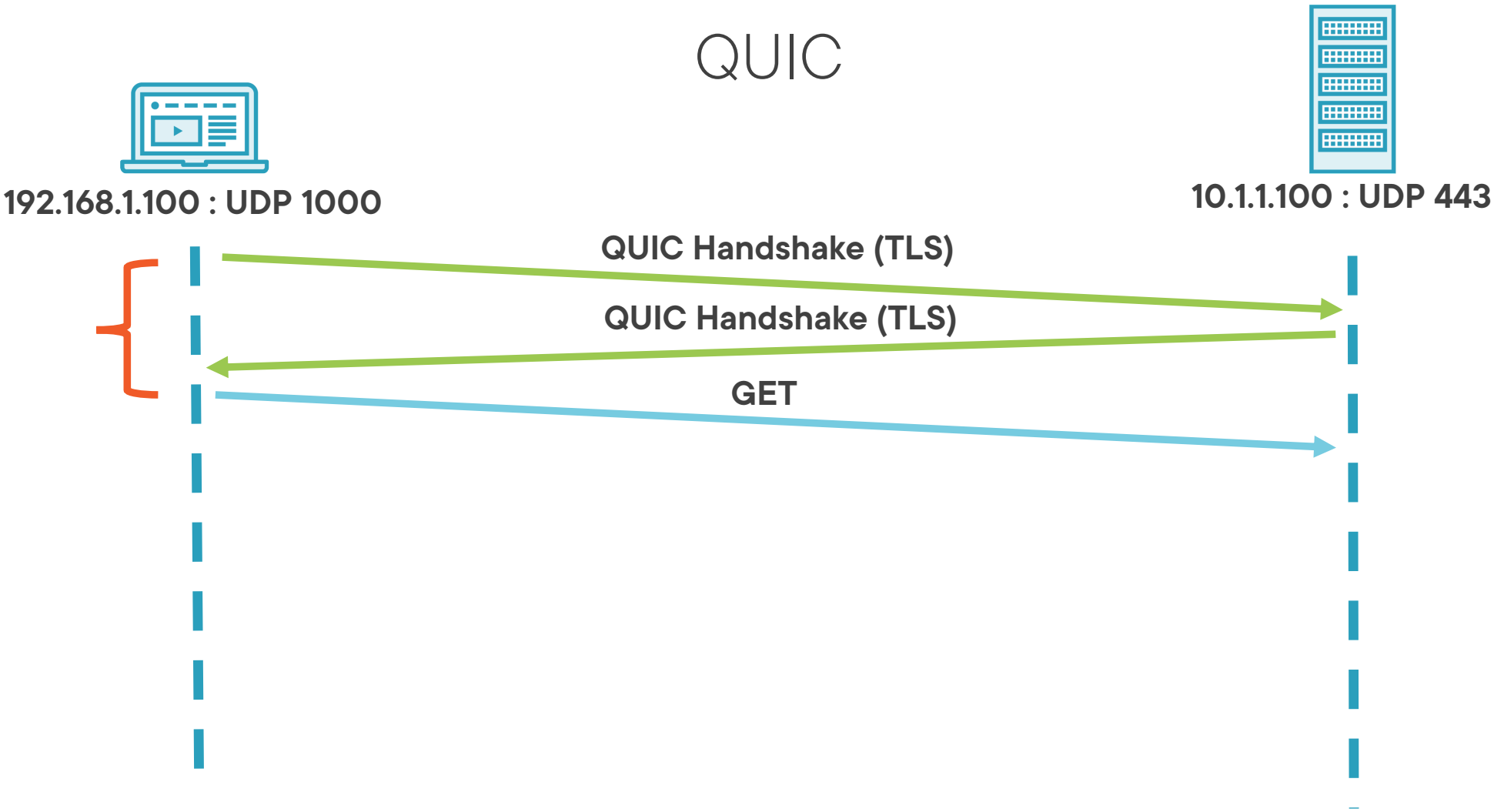
Network Round-Trips

The TCP and TLS Handshakes take several roundtrips

Network Roundtrips



QUIC


192.168.1.100 : UDP 1000
10.1.1.100 : UDP 443
QUIC Handshake (TLS)
QUIC Handshake (TLS)
GET

TCP Header Security

```
▼ Transmission Control Protocol, Src Port: https (443), Dst Port: 60731 (60731),
    Source Port: https (443)
    Destination Port: 60731 (60731)
    [Stream index: 3]
    [TCP Segment Len: 409]
    Sequence Number: 2315    (relative sequence number)
    Sequence Number (raw): 3269656827
    [Next Sequence Number: 2724    (relative sequence number)]
    Acknowledgment Number: 2600    (relative ack number)
    Acknowledgment number (raw): 3198363326
    0101 .... = Header Length: 20 bytes (5)
  ▶ Flags: 0x018 (PSH, ACK)
    Window: 72
    [Calculated window size: 73728]
    [Window size scaling factor: 1024]
    Checksum: 0xf387 [unverified]
    [Checksum Status: Unverified]
    Urgent Pointer: 0
  ▶ [SEQ/ACK analysis]
  ▶ [Timestamps]
    TCP payload (409 bytes)
```

QUIC Fundamentals

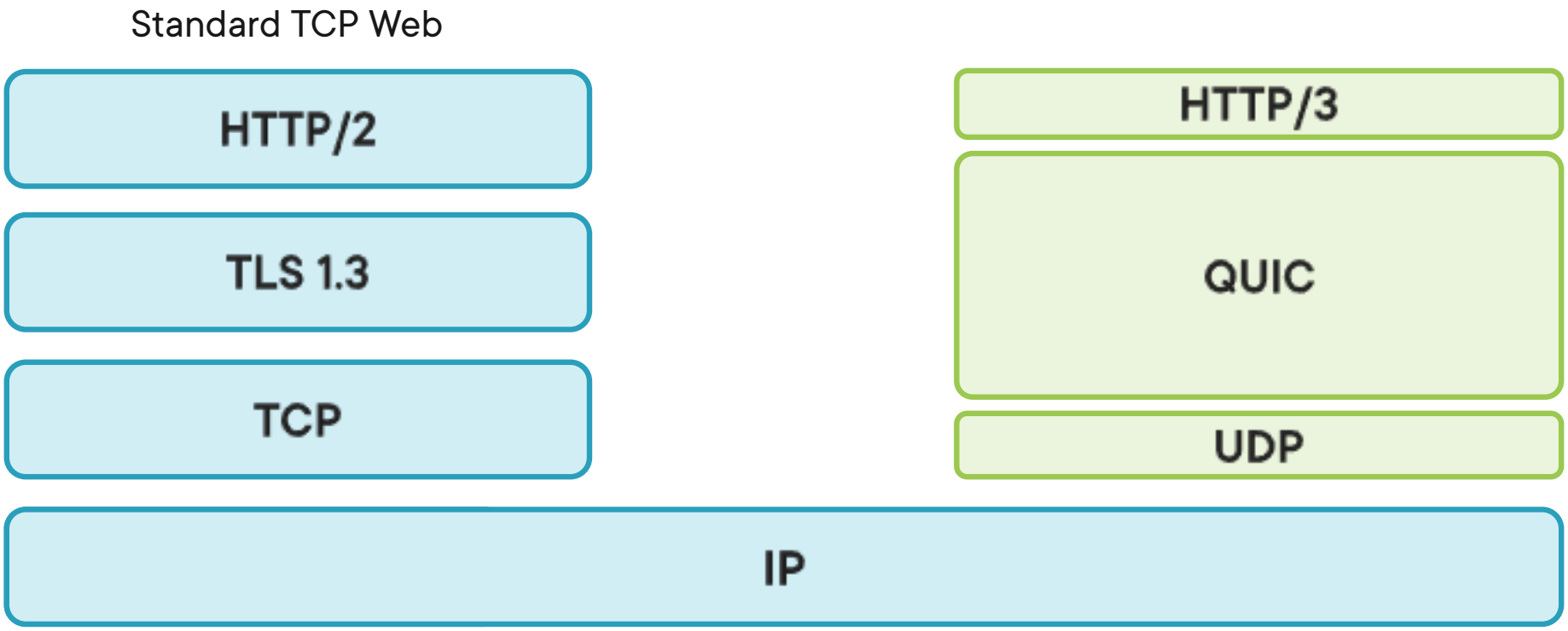
The History of QUIC - 2012

Quick UDP Internet Connections (QUIC)

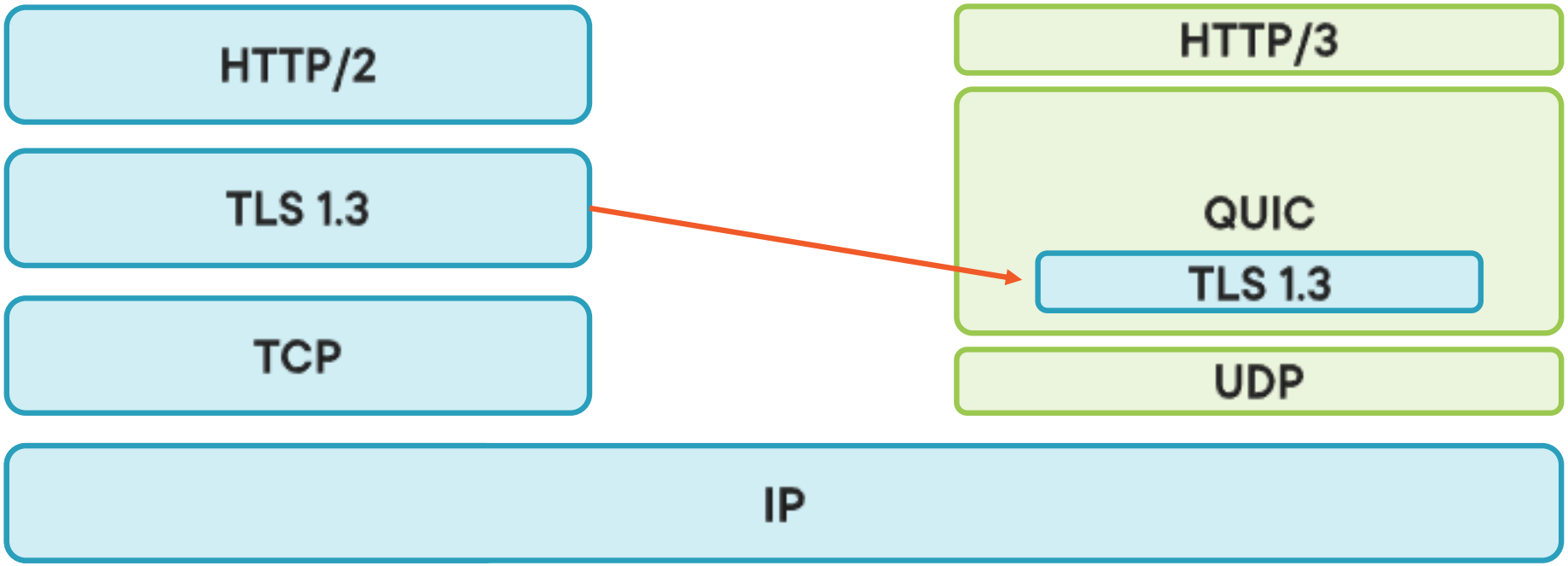
The History of QUIC - 2016

The Story of QUIC – 2021 Version 1

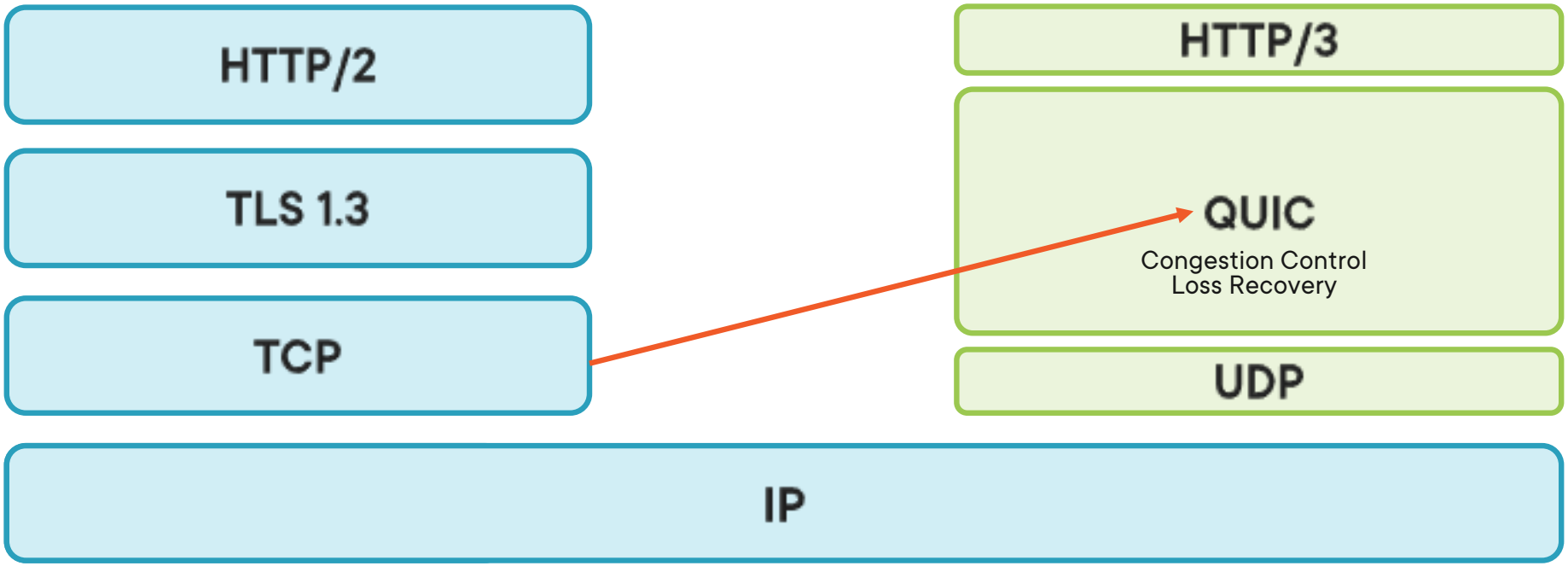
The QUIC Protocol Stack



How is QUIC Secured?



What About Packet Loss/Retransmission?



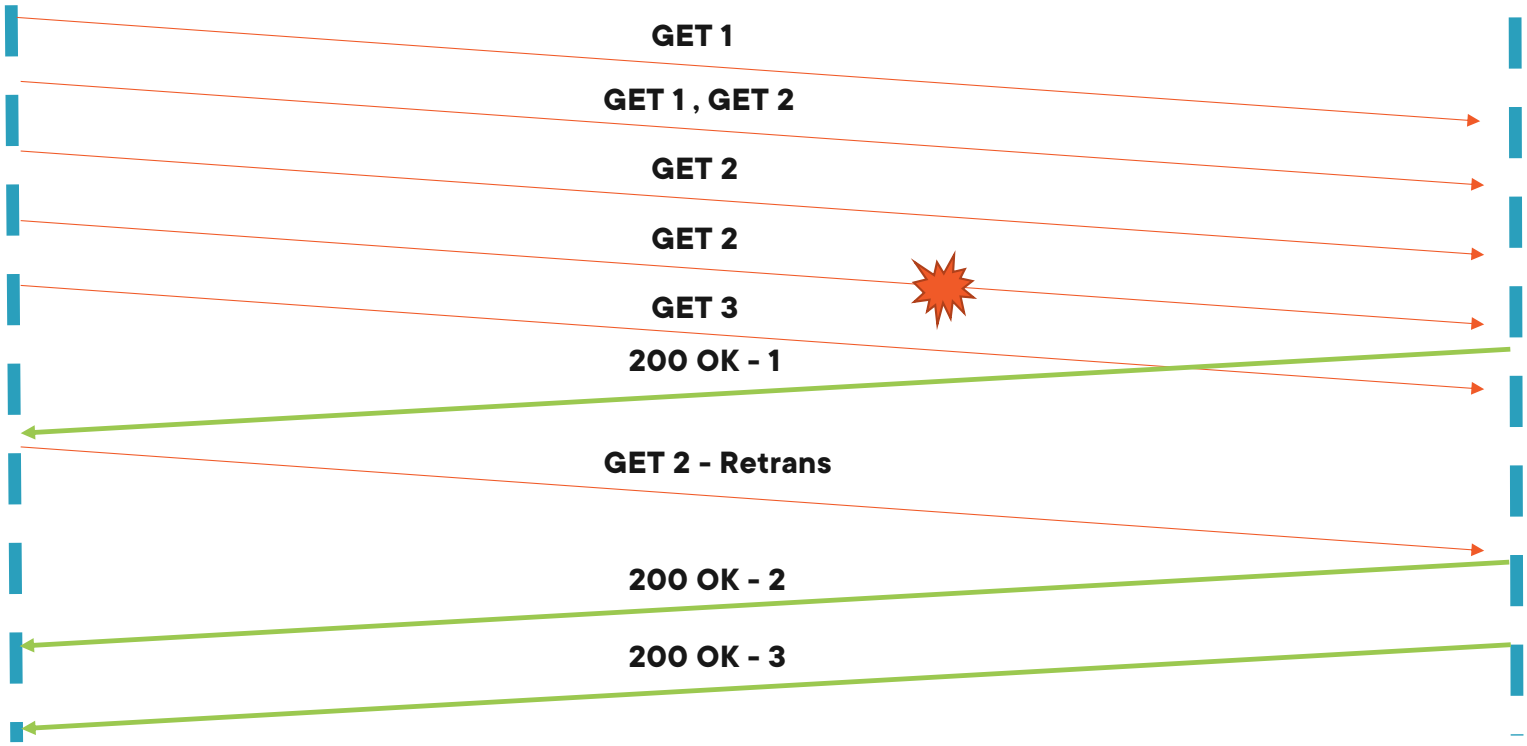
Is TCP Dead?

QUIC – The Pathway to HTTP/3

Head of Line Blocking

192.168.1.100 : 1000

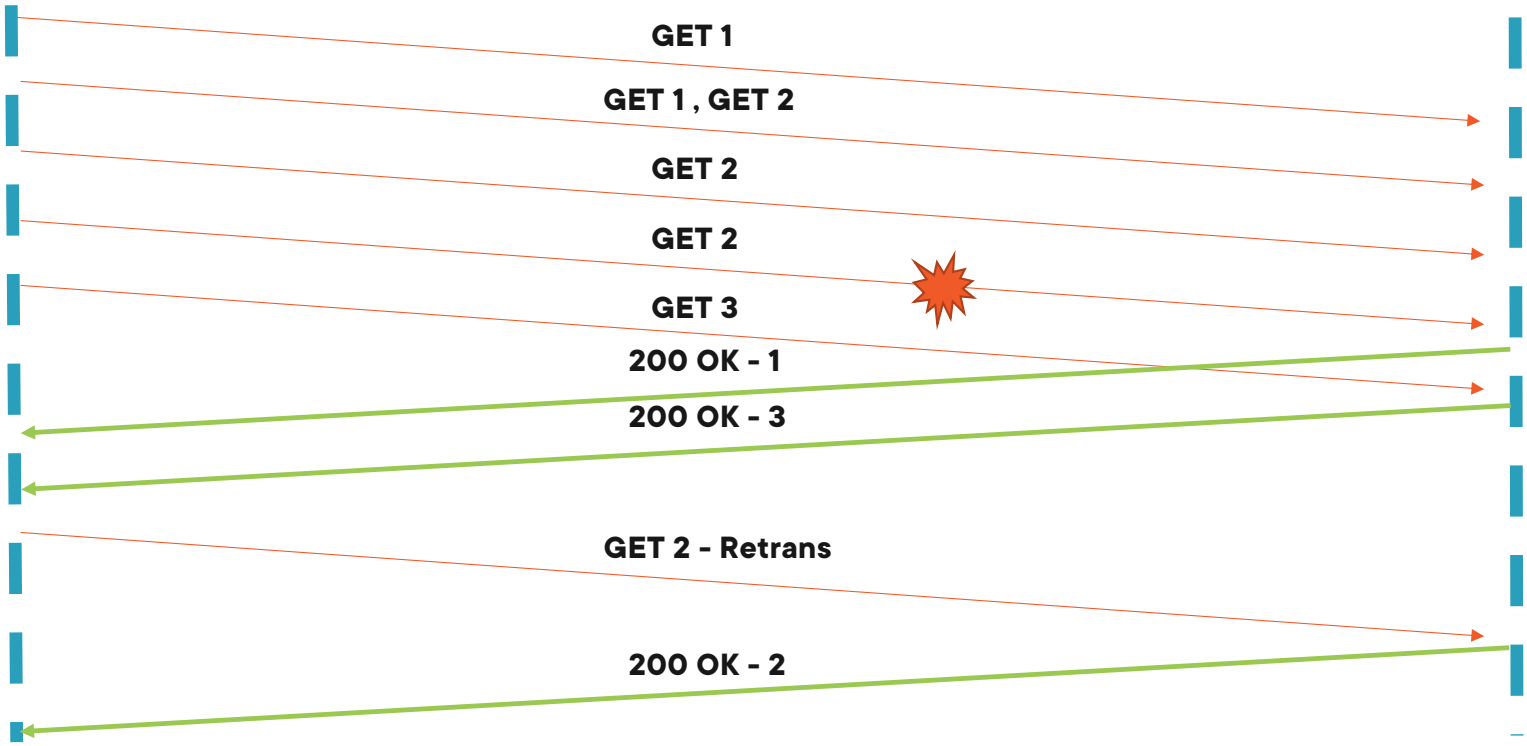
10.1.1.100 : 443



HTTP/3 Over QUIC

192.168.1.100 : 1000

10.1.1.100 : 443



Demo

Lab 1 – Hands-On With QUIC