HTTP/2 Semantics over QUIC

draft-shade-quic-http2-mapping-00

Current State

- Documents current state of QUIC protocol as deployed by Google

- Reflects iterative evolution from HTTP/2 over TCP to QUIC

- Minor process stuff to add
  - Security Considerations, IANA, etc.
  - Interaction with HTTP/2 registries, if any

Connection Negotiation

- HTTP/QUIC detected by use of Alt-Svc
  - Alt-Svc: quic=":443";v="32,33"
  - New "v" parameter for Alt-Svc defined to carry version negotiation hints
- Negotiation of HTTP/QUIC versus foo/QUIC not yet specified
  - More general QUIC discussion to be had here
  - Could reasonably be implied by UDP port number assignments
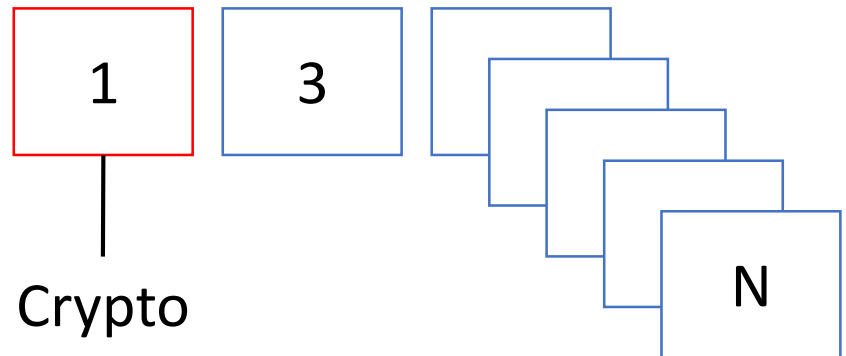 - Could be negotiated by ALPN token in TLS handshake

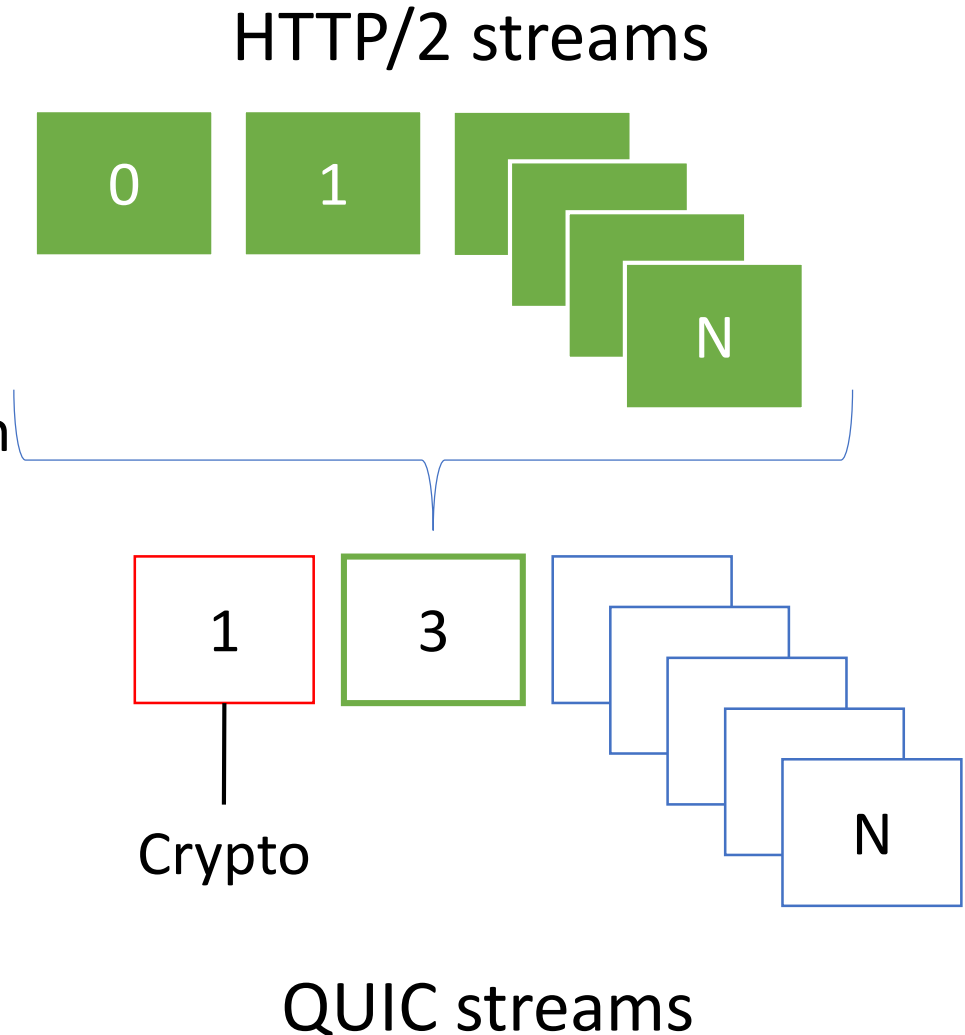# Connection Structure
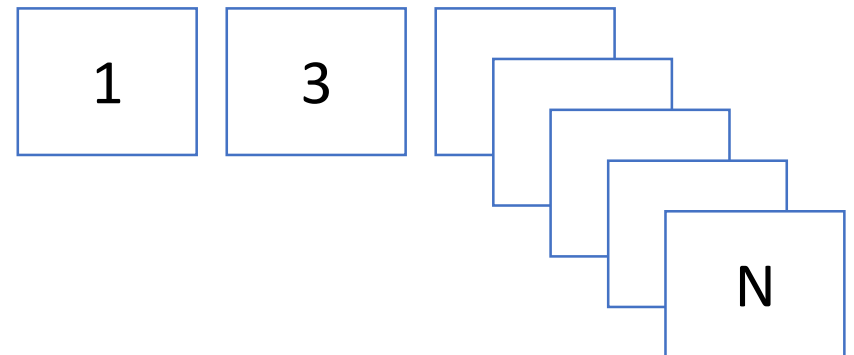
QUIC streams

Connection Structure

- Stream 1 reserved for crypto
 - Core QUIC spec

Crypto

QUIC streams

Connection Structure

- Stream 1 reserved for crypto

- Stream 3 reserved for abridged HTTP/2 session

  - Reflects migration path from TCP to QUIC

  - Functionality added to QUIC is removed from HTTP/2

    - PING

    - GOAWAY

    - Flow Control

HTTP/2 streams

| 0 | 1 |

N

| 1 | 3 |

Crypto

N

QUIC streams

Connection Structure

- Stream 1 reserved for crypto
- Stream 3 reserved for abridged HTTP/2 session
- HTTP/2 streams straddle QUIC Stream 3 *and* another QUIC stream
  - H2 Stream 0 is only on QUIC Stream 3
  - Other QUIC streams replace DATA frames
  - All other frames (HPACK) on QUIC Stream 3

HTTP/2 streams

| 0 | ~~1~~ 5 | | | N |

QUIC streams

| 1 | 3 | | | N |

Crypto
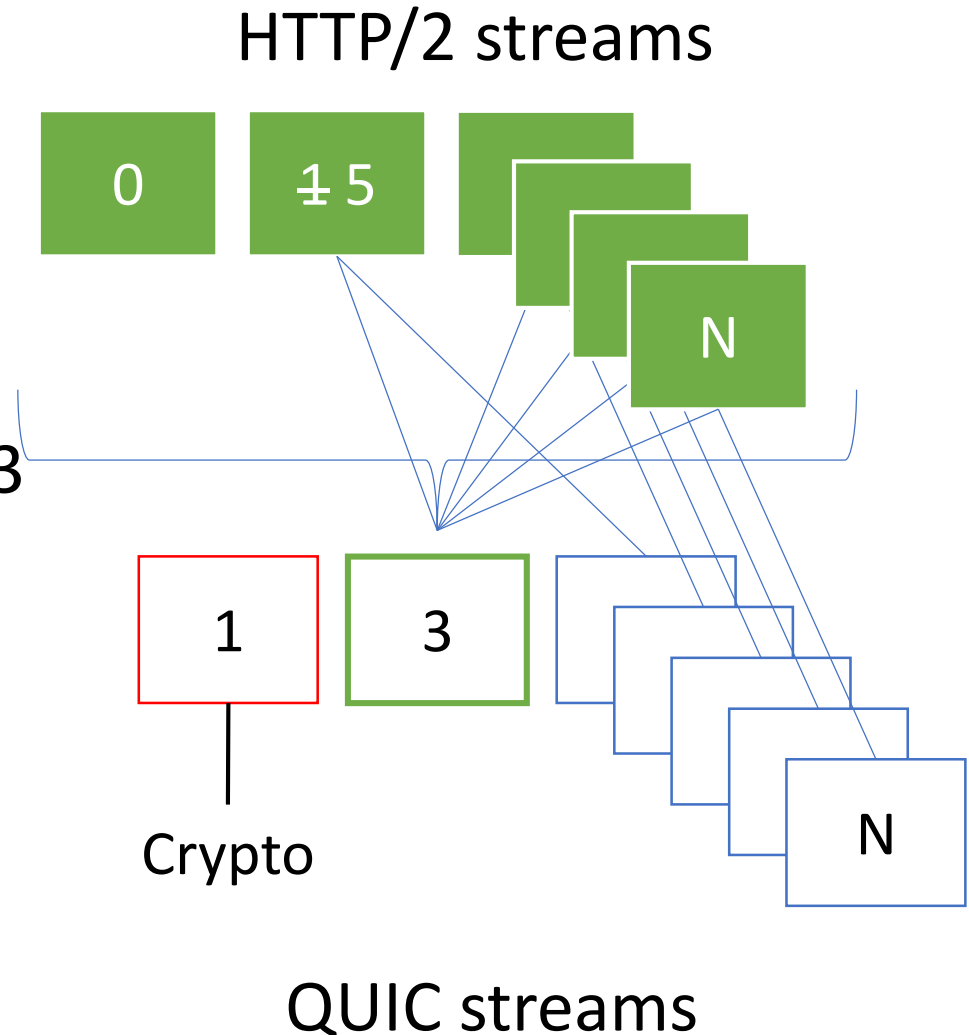
A Fork in the Road

HTTP/2 over QUIC

Pro:

- Reuse existing HTTP/2 framing code
- H2 extensions will (probably) work unchanged

Con:

- Double-mux
- Head-of-line blocking on HPACK

Fresh HTTP Mapping over QUIC

Pro:

- Leave streams to QUIC
- Simplifies stream management

Con:

- New framing required
- HLB-avoiding header compression is a hard problem
  - HPACK => QPACK?

Some other possible routes

- Ephemeral streams
  - QUIC stream per HTTP/2 frame
  - Frames arrive fully out-of-order
    - HTTP layer would be responsible for ordering and assembly
  - QUIC can't flow-control HTTP/2 streams this way
- Stream per frame type
  - Protects extensions from ordering requirements amongst their own frames
  - Doesn't solve cross-type ordering requirements
    - SETTINGS
    - HPACK