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
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

QUIC streams

HTTP/2 streams

0 1 N
1 3 N
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
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