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QUIC Multiplexing
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Abstract

If QUIC is to be used for peer-to-peer data transport with NAT traversal, then it is necessary to be able to demultiplex QUIC and other protocols used in WebRTC on a single UDP port. This memo discusses a proposed scheme for demultiplexing.

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1. Introduction

QUIC [I-D.ietf-quic-transport] is a new network transport protocol. While it is initially intended as a replacement for TCP in order to better support HTTP/2 [RFC7540], with the introduction of datagram support [I-D.paully-quic-datagram] it will also support unreliable as well as reliable transport. HTTP is an asymmetric client-server protocol, but other uses of QUIC support peer-to-peer operation and so will need effective NAT traversal using ICE [RFC5245], which makes use of STUN [RFC5389] and TURN [RFC5766] to discover NAT bindings. Therefore for QUIC to be utilized for peer-to-peer data transport, QUIC and STUN must be able to multiplex on the same port.

In a WebRTC scenario where RTP is used to transport audio and video and QUIC is used for data exchange, SRTP [RFC3711] is keyed using DTLS-SRTP [RFC5764] and therefore SRTP/SRTCP [RFC3550], STUN, TURN, DTLS [RFC6347] and QUIC will need to be multiplexed on the same port.

Within the W3C, a Javascript API for the use of QUIC for peer-to-peer data exchange [WEBRTC-QUIC] is under development within the ORTC Community Group, and an Origin Trial [WEBRTC-QUIC-TRIAL] implementing

an early version of this API shipped in the Chrome and Edge browsers. Due to lack of demultiplexing support, the Origin Trial could only support peer-to-peer use of QUIC over a standalone ICE transport, as defined in [WEBRTC-ICE].

As noted in [RFC7983] Figure 3, protocol demultiplexing currently relies upon differentiation based on the first octet, as follows:

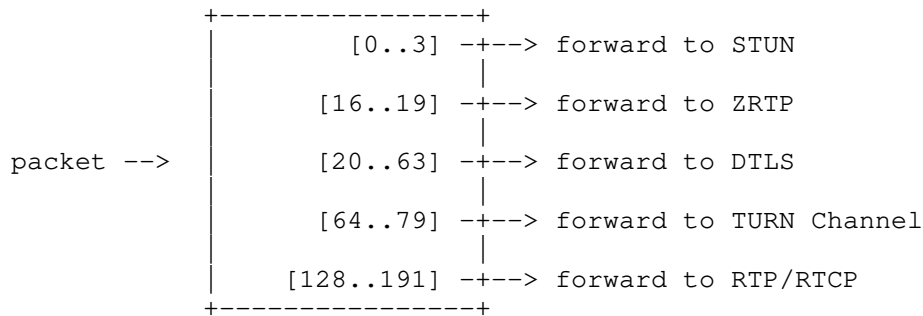


Figure 1: RFC 7983 packet demultiplexing algorithm.

As noted by Colin Perkins and Lars Eggert in [QUIC-Issue][QUIC-MULTI] this created a potential conflict with the design of the QUIC headers described in versions of [I-D.ietf-quic-transport] prior to -08.

1.1. Terminology

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [RFC2119].

2. Solution

As of draft 18, the QUIC Long Header packet type field defined in [I-D.ietf-quic-transport] Section 17.2 appears as follows:

```

+---+---+---+---+---+---+
| 1 | 1 | T | X | X | X | X |
+---+---+---+---+---+---+

```

Where:

T = Long Packet Type (0x0 - 0x3)
X = Type-Specific Bits.

This potentially produces values of the first octet in the ranges 192-255.

The QUIC Short Header packet type field defined in [I-D.ietf-quic-transport] Section 17.3 appears as follows:

```

+---+---+---+---+---+
|0|1|S|R|R|K|P P|
+---+---+---+---+---+

```

Where:

S = Spin Bit
R = Reserved bits
K = Key Phase bit
P = Packet Number Length.

This potentially produces values of the first octet in the ranges 64-127 (assuming that the reserved bits may not always be set to zero).

As a result, the multiplexing scheme supported in -18 operates as follows:

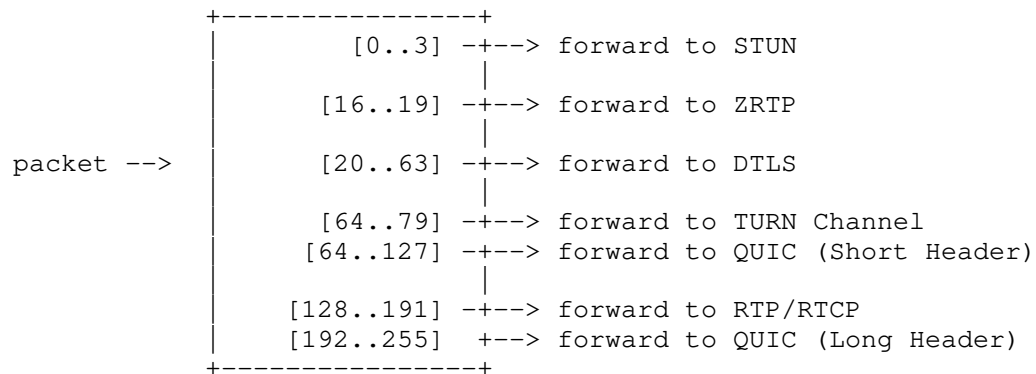


Figure 3: Packet demultiplexing algorithm in Draft 18.

Note that while the above diagram has a potential conflict between packets sent in TURN Channels and the QUIC short header, this conflict is not considered serious for WebRTC where TURN Channels are rarely used.

3. Security Considerations

The solution discussed in this document could potentially introduce some additional security considerations beyond those detailed in [RFC7983].

Due to the additional logic required, if mis-implemented, heuristics have the potential to mis-classify packets.

When QUIC is used for only for data exchange, the TLS-within-QUIC exchange [I-D.ietf-quic-tls] derives keys used solely to protect the QUIC data packets. If properly implemented, this should not affect the transport of SRTP nor the derivation of SRTP keys via DTLS-SRTP, but if badly implemented, both transport and key derivation could be adversely impacted.

4. IANA Considerations

This document does not require actions by IANA.

5. References

5.1. Informative References

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