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B. Aboba
Microsoft Corporation
G. Salgueiro
Cisco Systems
C. Perkins
University of Glasgow
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Multiplexing Scheme Updates for QUIC
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Abstract

This document defines how QUIC, Datagram Transport Layer Security (DTLS), Real-time Transport Protocol (RTP), RTP Control Protocol (RTCP), Session Traversal Utilities for NAT (STUN), Traversal Using Relays around NAT (TURN), and ZRTP packets are multiplexed on a single receiving socket.

This document updates RFC 7983 and RFC 5764.

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1. Introduction

"Multiplexing Scheme Updates for Secure Real-time Transport Protocol (SRTP) Extension for Datagram Transport Layer Security (DTLS)" [RFC7983] defines a scheme for a Real-time Transport Protocol (RTP) [RFC3550] receiver to demultiplex DTLS [RFC6347], Session Traversal Utilities for NAT (STUN) [RFC8489], Secure Real-time Transport Protocol (SRTP) / Secure Real-time Transport Control Protocol (SRTCP) [RFC3711], ZRTP [RFC6189] and TURN Channel packets arriving on a single port.

This document updates [RFC7983] and [RFC5764] to also allow QUIC [RFC9000] to be multiplexed on the same port. Currently implemented QUIC congestion control mechanisms are unsuitable for transport of media in realtime communications use cases. As a result, peer-to-peer operation in WebRTC scenarios, described in [P2P-QUIC] [P2P-QUIC-TRIAL], used RTP for transport of audio and video while QUIC was used for data exchange.

In such a scenario, SRTP [RFC3711] is keyed using DTLS-SRTP [RFC5764] and therefore SRTCP/SRTCP [RFC3550], STUN, TURN, DTLS [RFC6347] and QUIC need to be multiplexed on the same port. If QUIC congestion control is modified to enable peer-to-peer transport of audio and video with low latency [I-D.engelbart-rtp-over-quick] as well as data, only STUN, TURN and QUIC would need to be multiplexed on the same port.

Since new versions of QUIC are allowed to change aspects of the wire image, there is no guarantee that future versions of QUIC beyond version 1 will adhere to the multiplexing scheme described in this document.

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. Multiplexing of TURN Channels

TURN channels are an optimization where data packets are exchanged with a 4-byte prefix instead of the standard 36-byte STUN overhead (see Section 3.5 of [RFC8656]). [RFC7983] allocated the values from 64 to 79 in order to allow TURN channels to be demultiplexed when the TURN Client does the channel binding request in combination with the demultiplexing scheme described in [RFC7983].

As noted in [I-D.aboba-avtcore-quick-multiplexing], the first octet of

a QUIC short header packet falls in the range 64 to 127, thereby overlapping with the allocated range for TURN channels of 64 to 79.

The first octet of QUIC long header packets fall in the range 192 to 255. Since QUIC long header packets precede QUIC short header packets, if no packets with a first octet in the range of 192 to 255 have been received, a packet whose first octet is in the range of 64 to 79 can be demultiplexed unambiguously as TURN Channel traffic. Since WebRTC implementations supporting QUIC data exchange do not utilize TURN Channels, once packets with a first octet in the range of 192 to 255 have been received, a packet whose first octet is in the range of 64 to 127 can be demultiplexed as QUIC traffic.

3. Updates to RFC 7983

This document updates the text in Section 7 of [RFC7983] (which in turn updates [RFC5764]) as follows:

OLD TEXT

The process for demultiplexing a packet is as follows. The receiver looks at the first byte of the packet. If the value of this byte is in between 0 and 3 (inclusive), then the packet is STUN. If the value is between 16 and 19 (inclusive), then the packet is ZRTP. If the value is between 20 and 63 (inclusive), then the packet is DTLS. If the value is between 64 and 79 (inclusive), then the packet is TURN Channel. If the value is in between 128 and 191 (inclusive), then the packet is RTP (or RTCP, if both RTCP and RTP are being multiplexed over the same destination port). If the value does not match any known range, then the packet MUST be dropped and an alert MAY be logged. This process is summarized in Figure 3.

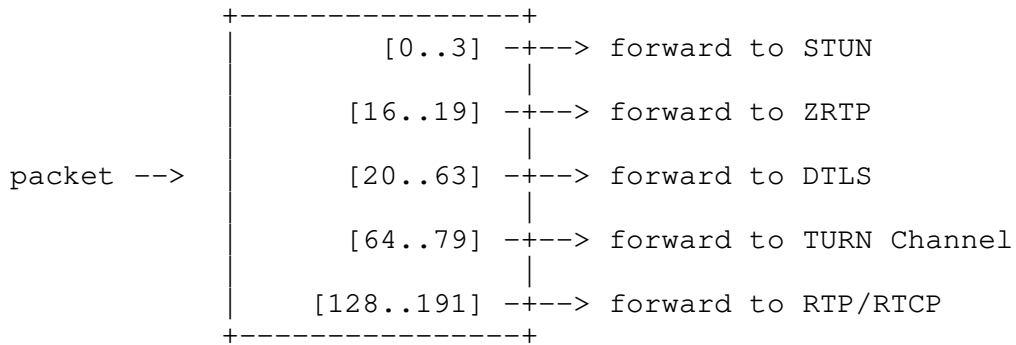


Figure 3: The DTLS-SRTP receiver's packet demultiplexing algorithm.

END OLD TEXT

NEW TEXT

The process for demultiplexing a packet is as follows. The receiver looks at the first byte of the packet. If the value of this byte is in between 0 and 3 (inclusive), then the packet is STUN. If the value is between 16 and 19 (inclusive), then the packet is ZRTP. If the value is between 20 and 63 (inclusive), then the packet is DTLS. If the value is in between 128 and 191 (inclusive) then the packet is RTP (or RTCP, if both RTCP and RTP are being multiplexed over the same destination port). If the value is between 80 and 127 or between 192 and 255 (inclusive) then the packet is QUIC. If the value is between 64 and 79 inclusive, then if a packet has been previously forwarded that is in the range of 192 and 255, then the packet is QUIC, otherwise it is TURN Channel.

If the value does not match any known range, then the packet MUST be dropped and an alert MAY be logged. This process is summarized in Figure 3.

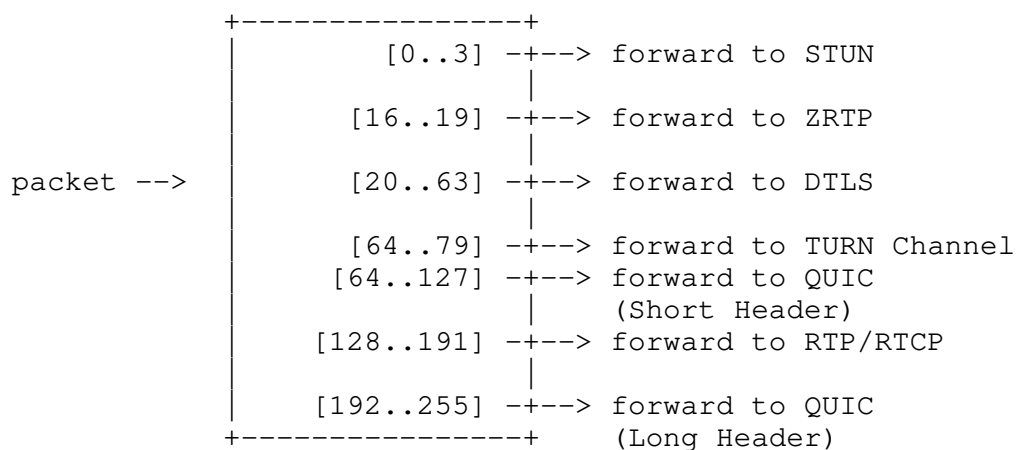


Figure 3: The receiver's packet demultiplexing algorithm.

END NEW TEXT

4. 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 [RFC9001] 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.

5. IANA Considerations

This document does not require actions by IANA.

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Authors' Addresses

Bernard Aboba
Microsoft Corporation
One Microsoft Way
Redmond, WA 98052
USA

Email: bernard.aboba@gmail.com

Gonzalo Salgueiro
Cisco Systems
7200-12 Kit Creek Road
Research Triangle Park, NC 27709
United States of America

Email: gsalguei@cisco.com

Colin Perkins
School of Computing Science
University of Glasgow
Glasgow G12 8QQ
United Kingdom

Email: csp@csperkins.org