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Authors: Z. Li S. Chen H. Shi
 Huawei Huawei Huawei
Generalized IPv6 Tunnel for QUIC

Abstract

This document defines a new encapsulation method for QUIC packet transmission based on IPv6 extension headers. This method enables QUIC packet transmission to easily inherit the extended functions of IPv6.

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1. Introduction

[[I-D.li-rtgwg-generalized-ipv6-tunnel](#)] proposes the Generalize IPv6 Tunnel to unify the IP tunnels and remove duplicate functions and support new features. QUIC, as a general-purpose transport layer network protocol, is gradually being applied on the network side, such as DNS over QUIC [[RFC9250](#)] and QUIC tunnel [[I-D.piraux-quic-tunnel](#)]. QUIC tunnel-based packet transmission also faces the issue of being extended to support new features.

This document defines encapsulation of QUIC headers into the GIP6 tunnel encapsulation and attempts to solve these issues.

2. Terminology

*APN: Application-aware Networking

*IOAM: In-situ Operations, Administration, and Maintenance

2.1. Requirements Language

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in BCP 14 [[RFC2119](#)] [[RFC8174](#)] when, and only when, they appear in all capitals, as shown here.

3. Problem Statement

As mentioned in the draft [[I-D.li-rtgwg-generalized-ipv6-tunnel](#)], many new features, such as Alternate Marking [[I-D.ietf-6man-ipv6-alt-mark](#)], IOAM [[I-D.ietf-ippm-ioam-ipv6-options](#)], resource isolation [[I-D.ietf-6man-enhanced-vpn-vtn-id](#)], and APN [[I-D.li-apn-ipv6-encap](#)], are emerging and the corresponding encapsulations over the IPv6 are defined. Since there are all kinds

of existing IP tunnels (including UDP-based tunnels), if these new features need to be supported over these tunnels, it is very difficult to extend for these tunnels. If QUIC is used as a tunnel for transmission of data packets in the network, it will also face the challenge to support these new features.

4. Encapsulation of GIP6 for QUIC

[[I-D.li-rtgwg-generalized-ipv6-tunnel](#)] defined the GIP6 tunnel which uses the IPv6 header and IPv6 extension header to support both functions of existing IP tunnels and new features. The GIP6 tunnel unifies the IP tunnels which removes the duplicate functions and supports new features. This can greatly reduce the repeated effort to extend the exiting IP tunnels to support the new features.

To support existing QUIC functions, the GIP6 tunnel is extended as follows:

1. Definition of the QUIC Option: A new option called QUIC Option is defined to carry the QUIC header information. The QUIC Option **MUST** only be encapsulated in the Destination Options Header (DOH). The format of the QUIC option is shown in [Figure 1](#):
2. The function of the UDP header for ECMP can replaced by the flow label of the IPv6 header in the GIP6 tunnel. To ensure compatibility, the value of the flow label calculated for the purpose of ECMP **SHOULD** be the same as that of the source port of the UDP.

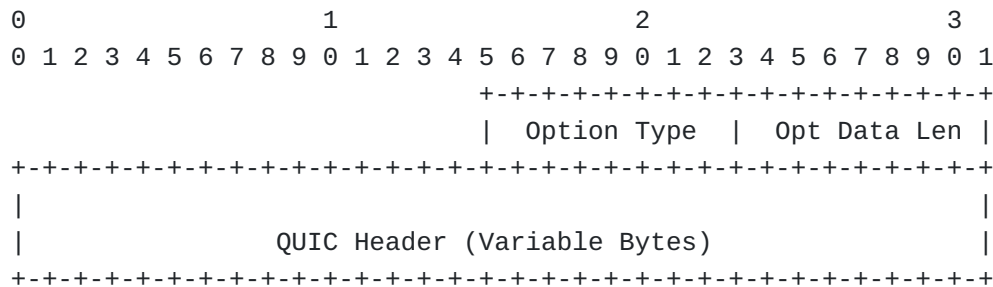


Figure 1: QUIC option header

where:

*Option Type: 8-bit selector. QUIC option. Value TBD by IANA.

*Opt Data Len: 8-bit unsigned integer. Length of the option, in octets, excluding the Option Type and Option Length fields.

*Option Data: variable. QUIC Header Information. For the detailed definition of the QUIC headers, please refer to [[RFC8999](#)].

5. Security Considerations

This document does not introduce any new security considerations.

6. IANA Considerations

The Option Type should be assigned in IANA's "Destination Options" registry.

This draft requests the following IPv6 Option Type assignment from the Destination Options sub-registry of [Internet Protocol Version 6 \(IPv6\) Parameters](#).

Hex Value	Binary Value			Description	Reference
	act	chg	rest		
-----	-----	-----	-----	-----	-----
TBD	00	0	TBD	QUIC	[This draft]

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Authors' Addresses

Zhenbin Li
Huawei
Beiqing Road
Beijing
China

Email: lizhenbin@huawei.com

Shuanglong Chen
Huawei
Beiqing Road
Beijing

Email: chenshuanglong@huawei.com

Hang Shi
Huawei
Beiqing Road
Beijing
China

Email: shihang9@huawei.com