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IPv6 Support for Generic Routing Encapsulation (GRE)
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Abstract

Generic Routing Encapsulation (GRE) can be used to carry any network layer protocol over any network layer protocol. GRE procedures are specified for IPv4, used as either the payload or delivery protocol. However, GRE procedures are not specified for IPv6, used as either the payload or delivery protocol.

This document specifies GRE procedures for IPv6, used as either the payload or delivery protocol, and updates RFC 2784, the original GRE specification.

Requirements Language

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].

Status of This Memo

This Internet-Draft is submitted in full conformance with the provisions of BCP 78 and BCP 79.

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This Internet-Draft will expire on April 30, 2015.

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1. Introduction

Generic Routing Encapsulation (GRE) [RFC2784] [RFC2890] can be used to encapsulate and carry any network layer protocol (payload) over any network layer protocol (delivery). GRE procedures are specified for IPv4 [RFC0791], used as either the payload or delivery protocol. However, GRE procedures are not specified for IPv6 [RFC2460], used as either the payload or delivery protocol.

This document specifies GRE procedures for IPv6, used as either the payload or delivery protocol, and updates RFC 2784 [RFC2784].

1.1. Terminology

The following terms are specific to GRE and are modeled from [RFC2784]:

- GRE delivery header - an IPv4 or IPv6 header whose source address represents the GRE ingress node and whose destination address represents the GRE egress node. The GRE delivery header encapsulates a GRE header.

- GRE header - the GRE protocol header. The GRE header is encapsulated by the GRE delivery header and encapsulates GRE payload.

- GRE payload packet - a network layer packet that needs to be encapsulated and delivered to some destination, and is encapsulated by the GRE header.

The following terms are specific MTU discovery:

- path MTU (PMTU) - the minimum MTU of all the links in a path between a source node and a destination node. If the source and destination node are connected through equal cost multipath (ECMP), the PMTU is equal to the minimum link MTU of all links contributing to the multipath.

- Path MTU Discovery (PMTUD) - A procedure for dynamically discovering the PMTU between two nodes on the Internet. PMTUD procedures for IPv6 are defined in [RFC1981].

2. GRE Header Fields

This document does not change any other fields or behaviors of the GRE specification [RFC2784] [RFC2890].

2.1. Checksum Present

The Checksum Present field SHOULD be set to zero by senders if IPv6 is used as a delivery protocol. Receivers MUST also accept a value of one in this field and use it to calculate the GRE header length but they MUST NOT verify the contents of the Checksum field.

2.2. Protocol Type

The Protocol Type field contains the protocol type of the payload packet. These Protocol Types are defined in [ETYPES]. An implementation receiving a packet containing a Protocol Type which is not listed in [ETYPES] SHOULD discard the packet.

3. IPv6 as a GRE Payload

When the GRE payload is IPv6, the Protocol Type field in the GRE header MUST be set to 0x86DD.

4. IPv6 as a GRE Delivery Protocol

When the GRE delivery protocol is IPv6, the GRE header can immediately follow the GRE delivery header. Alternatively, IPv6 extension headers MAY be inserted between the GRE delivery header and the GRE header. However, the IPv6 Destination Options Header MUST NOT be inserted between the GRE delivery header and the GRE header.

If the GRE header immediately follows the GRE delivery header, the Next Header field in the IPv6 header of the GRE delivery packet MUST be set to the value 47. If extension headers are inserted between the GRE delivery header and the GRE header, the Next Header field in the last IPv6 extension header MUST be set to 47.

Following guidance provided in Section 5 of [RFC2460], GRE ingress nodes SHOULD implement PMTUD, in order to discover and take advantage of PMTUs greater than the IPv6 required minimum (1280 octets). However, a GRE ingress node MAY simply restrict itself to sending packets no larger than 1280 octets, and omit implementation of PMTUD.

5. IANA Considerations

This document makes no request of IANA.

6. Security Considerations

This document adds no additional security risks to GRE, beyond what is specified in [RFC2784]. It also does not provide any additional security for GRE.

7. Acknowledgements

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8. Normative References

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[RFC2460] Deering, S. and R. Hinden, "Internet Protocol, Version 6 (IPv6) Specification", RFC 2460, December 1998.

[RFC2784] Farinacci, D., Li, T., Hanks, S., Meyer, D., and P. Traina, "Generic Routing Encapsulation (GRE)", RFC 2784, March 2000.

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