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GRE Encapsulation for In-situ OAM Data
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Abstract

In-situ Operations, Administration, and Maintenance (IOAM) records operational and telemetry information in the packet while the packet traverses a path between two points in the network. This document outlines how IOAM data fields are encapsulated in GRE.

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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time. It is inappropriate to use Internet-Drafts as reference material or to cite them other than as "work in progress."

This Internet-Draft will expire on September 4, 2018.

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1. Introduction

In-situ Operations, Administration, and Maintenance (IOAM) records operational and telemetry information in the packet while the packet traverses a path between two points in the network. This document outlines how IOAM data fields are encapsulated in the Generic Routing Encapsulation (GRE) [RFC2784].

2. Conventions

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.

2.2. Abbreviations

Abbreviations used in this document:

E2E: Edge-to-Edge

GRE: Generic Routing Encapsulation

IOAM: In-situ Operations, Administration, and Maintenance

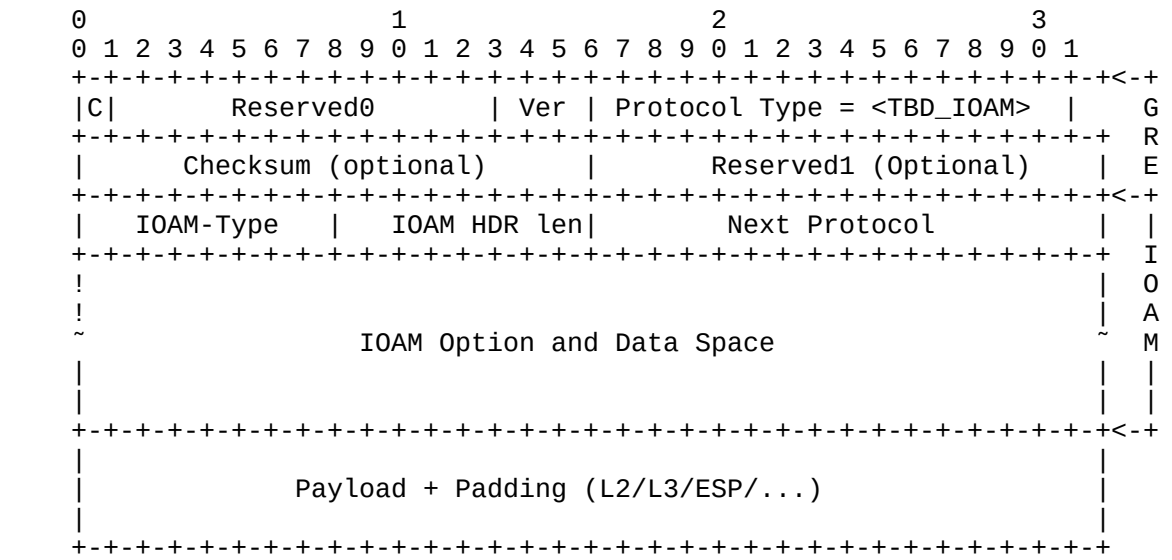
OAM: Operations, Administration, and Maintenance

POT: Proof of Transit

3. In-situ OAM Metadata Transport in GRE

GRE encapsulation is defined in [RFC2784]. IOAM encapsulation in GRE follows the GRE header.

IOAM data fields are carried in GRE using a Protocol Type value of TBD_IOAM. An IOAM header is added containing the different IOAM data fields defined in [I-D.ietf-ippm-ioam-data]. In an administrative domain where IOAM is used, insertion of the IOAM protocol header in GRE is enabled at the GRE tunnel endpoints, which also serve as IOAM encapsulating/decapsulating nodes by means of configuration.



The GRE header and fields are defined in [RFC2784]. The GRE Protocol Type value is TBD_IOAM.

The IOAM header is defined as follows.

IOAM Type: 8-bit field defining the IOAM Option type, as defined in Section 7.2 of [I-D.ietf-ippm-ioam-data].

IOAM HDR Len: 8 bits Length field contains the length of the variable IOAM data octets in 4-octet units.

Next Protocol: 16 bits Next Protocol Type field contains the protocol type of the packet following IOAM protocol header. When the most significant octet is 0x00, the Protocol Type is taken to be an IP Protocol Number as defined in [IP-PROT]. Otherwise, the Protocol Type is defined to be an EtherType value from [ETYPES]. An implementation receiving a packet containing a Protocol Type which is not listed in one of those registries SHOULD discard the packet.

IOAM Option and Data Space: IOAM option header and data is present as specified by the IOAM-Type field, and is defined in Section 4 of [I-D.ietf-ippm-ioam-data].

Multiple IOAM options MAY be included within the GRE encapsulation. For example, if a GRE encapsulation contains two IOAM options before a data packet, the Next Protocol field of the first IOAM option will contain the value of TBD_IOAM, while the Next Protocol field of the

second IOAM option will contain the Ethertype or IP protocol Number indicating the type of the data packet.

4. Security Considerations

This document describes the encapsulation of IOAM data fields in GRE. Security considerations of the specific IOAM data fields for each case (i.e., Trace, Proof of Transit, and E2E) are described in defined in [I-D.ietf-ippm-ioam-data].

As this document describes new protocol fields within the existing GRE encapsulation, these are similar to the security considerations of [RFC2784].

IOAM data transported in an OAM E2E header SHOULD be integrity protected (e.g., with IPsec ESP [RFC4303]) to detect changes made by a device between the sending and receiving OAM endpoints.

5. IANA Considerations

A new EtherType value is requested to be added to the [ETYPES] IANA registry. The description should be "In-situ OAM (IOAM)".

6. References

6.1. Normative References

[ETYPES] "IANA Ethernet Numbers", <https://www.iana.org/assignments/ieee-802-numbers/ieee-802-numbers.xhtml>.

[I-D.ietf-ippm-ioam-data] Brockners, F., Bhandari, S., Pignataro, C., Gredler, H., Leddy, J., Youell, S., Mizrahi, T., Mozes, D., Lapukhov, P., Chang, R., and d. daniel.bernier@bell.ca, "Data Fields for In-situ OAM", draft-ietf-ippm-ioam-data-01 (work in progress), October 2017.

[IP-PROT] "IANA Protocol Numbers", <https://www.iana.org/assignments/protocol-numbers/protocol-numbers.xhtml>.

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, DOI 10.17487/RFC2119, March 1997, <https://www.rfc-editor.org/info/rfc2119>.

[RFC2784] Farinacci, D., Li, T., Hanks, S., Meyer, D., and P. Traina, "Generic Routing Encapsulation (GRE)", RFC 2784, DOI 10.17487/RFC2784, March 2000, <https://www.rfc-editor.org/info/rfc2784>.

[RFC8174] Leiba, B., "Ambiguity of Uppercase vs Lowercase in RFC 2119 Key Words", BCP 14, RFC 8174, DOI 10.17487/RFC8174, May 2017, <https://www.rfc-editor.org/info/rfc8174>.

6.2. Informative References

[RFC4303] Kent, S., "IP Encapsulating Security Payload (ESP)", RFC 4303, DOI 10.17487/RFC4303, December 2005, <https://www.rfc-editor.org/info/rfc4303>.

Appendix A. Example GRE-IOAM Payloads

A.1. Example GRE-IOAM Tracing Payloads

TBD

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