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6lo RPL Information Header
[draft-bormann-6lo-rpl-mesh-01](#)

Abstract

This short draft provides a straw man for the RPL Information Header, a method to compress RPL Option [[RFC6553](#)] information within 6lowpan-style ("6lo") adaptation layers.

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[1.](#) Introduction

[I-D.thubert-6man-flow-label-for-rpl] defines a way to compress information from the [\[RFC6553\]](#) RPL Option, for inclusion in an IPv6 flow label. The present draft shows how to carry the same information in a RPL Information Header, in a potentially slightly more efficient way.

The RPL Information Header is added to the 6lo adaptation layer framework ([\[RFC4944\]](#), [\[RFC6282\]](#)) as a small number of additional dispatch codes.

(More background information in [Section 5.](#))

[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 [RFC 2119](#) [\[RFC2119\]](#).

[2.](#) Encoding

(Insert definitions from [\[I-D.thubert-6man-flow-label-for-rpl\]](#) here.)

Where [\[I-D.thubert-6man-flow-label-for-rpl\]](#) would carry the [\[RFC6553\]](#) information in a flow label:

Figure 3: continuation for U=1

Note that, for U=1, continuation bytes of the form XXXnnXXX, where nn is not 00, are available for future updates of this header (they do not necessarily imply a Frag1 header).

3. Operation

A 6lo compressor that is about to create either an [RFC 6282](#) IPHC header [[RFC6282](#)] or a Frag1 header [[RFC4944](#)] and finds a Hop-by-Hop

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Options header [[RFC2460](#)] with a single RPL Option [[RFC6553](#)] in it, performs the following checks:

1. Does the compression scheme in [[I-D.thubert-6man-flow-label-for-rpl](#)] apply? I.e.:
 - A. is no sub-tlv present in the RPL Option?
 - B. is SenderRank < 256?
2. Does the additional compression for S=0 apply? I.e.:
 - A. is SenderRank < 16?
 - B. is RPLInstanceID < 16?

If check 1 succeeds, the compressor removes the Hop-by-Hop Options header (replacing the zero-valued next header field in the IPv6 header with the value of the next header field of the Hop-by-Hop Options header), and, depending on the outcome of check 2, generates an RPL Information Header with S=0 or S=1 from the payload information in the RPL Option. It then continues generating the [RFC 6282](#) IPHC or [RFC 4944](#) Frag1 header, filling in the continuation of the RPL Information header as defined in [Section 2](#).

A 6lo decompressor that encounters a RPL Information header reverses this process, creating a Hop-by-Hop Options header with a single RPL Option carrying the information in the RPL Information header.

4. Discussion

(This section to be removed by the RFC editor.)

Compared to [[I-D.thubert-6man-flow-label-for-rpl](#)], the 6lo-based approach used here has the following advantages:

- o more efficient (in size) encoding possible
- o avoids any entanglement with flow label from [RFC 6437](#)
- o avoids any issues with undetected changes to flow label field, which might be:
 - * because the IPv6 header is not covered by a checksum
 - * because nodes that happen to become on-path use the flow label for something else

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- o nodes outside 6lo that do not need the compression do not have to deal with an alternate representations of the [RFC 6553](#) information

Compared to [[I-D.toutain-6lo-local-extensions](#)], RPL Information Header proposal is entirely focused on [RFC 6553](#) (with some extension bits left to possibly eventually cover [RFC 6554](#)). So it may be possible to complete this focused draft much faster than a general approach. Also, the result is likely to be more efficient. Finally, this draft can be ignored by implementations not implementing RPL.

5. Background

Some more historical background about compression and RPL: (This section to be removed by the RFC editor.)

The ROLL WG has a routing protocol, RPL [[RFC6550](#)], that requires some data to be shipped around together with IP packets. [[RFC6553](#)] and [[RFC6554](#)] define ways to do this that are consistent with the IP architecture: The RPL Option defined in [[RFC6553](#)] is a hop-by-hop option that provides RPL rank and instance-id, as well as a few flags; the Routing Header defined in [[RFC6554](#)] provides the source routing needed for downward-routed packets in RPL's dominant non-

storing mode.

Unfortunately, the overhead (signal-to-fluff ratio) for both representations is relatively high, and in a constrained environment, that matters.

An obvious next step would have been looking at ways to do header compression. Compressing RPL was extensively discussed, but mostly with a view to compressing the (control plane) ROLL messages carried in ICMPv6, not so much about the RPL information carried with the (data plane) IP packets themselves. GHC [[I-D.ietf-6lo-ghc](#)] is trying to be a reasonably useful, but also reasonably general way to compress the control plane messages.

For the data packets, the flow label (and its now predominant non-use) provides an attractive place in the IPv6 packets to ship around the [[RFC6553](#)] information, but not the potentially more substantial [[RFC6554](#)] information. In 6lo networks, normally [[RFC6282](#)] compresses away empty flow labels, but it is cheap to put them in, so a flow label really only costs 3 bytes (instead of the 8 bytes a RPL Option [[RFC6553](#)] costs). The most useful information from [[RFC6553](#)] can be stuffed into 19 bits, as demonstrated by [[I-D.thubert-6man-flow-label-for-rpl](#)].

[RFC6282] has extension points (GHC uses one of them), but not really useful ones for the ROLL data plane. So it appears it never occurred

to us that the best way to handle these 19 bits is to actually sidestep [[RFC6282](#)], and use the existing extension points of [[RFC4944](#)]. Until Laurent Toutain showed one way of doing this [[I-D.toutain-6lo-local-extensions](#)]. The present draft just went from there and used Laurent's idea for compressing the [[RFC6553](#)] option, in a way that is as efficient as (or, in most cases, actually more efficient than) using the flow label opportunity.

This means the present draft intends to replace the flow label bit allocation of [[I-D.thubert-6man-flow-label-for-rpl](#)]. It does not cover the "license-to-drop" the flow label that [[I-D.thubert-6man-flow-label-for-rpl](#)] implies (and that is denied by [[RFC6437](#)]). It also does not cover the compression of [[RFC6554](#)] source routing information, but does provide an extension point for adding that later.

6. IANA considerations

This draft requests IANA to assign the following four dispatch types in the "IPv6 Low Power Personal Area Network Parameters" registry:

01 0001SU

7. Security considerations

The security considerations of [[RFC4944](#)], [[RFC6282](#)], and [[RFC6553](#)] apply.

8. Acknowledgments

This document is based on the ideas in the specification [[I-D.thubert-6man-flow-label-for-rpl](#)]. Its use of the [RFC 4944](#) framework was inspired by [[I-D.toutain-6lo-local-extensions](#)]. Ralph Droms supplied a number of helpful comments on the -00 draft. The discussion in the 6man and roll working groups also was helpful.

9. References

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