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6LoWPAN Paging Dispatch
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Abstract

This specification introduces a new context switch mechanism for 6LoWPAN compression, expressed in terms of Pages and signaled by a new Paging Dispatch.

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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1. Introduction

The design of Low Power and Lossy Networks (LLNs) is generally focused on saving energy, a very constrained resource in most cases. The other constraints, such as the memory capacity and the duty cycling of the LLN devices, derive from that primary concern. Energy is often available from primary batteries that are expected to last for years, or is scavenged from the environment in very limited quantities. Any protocol that is intended for use in LLNs must be designed with the primary concern of saving energy as a strict requirement.

Controlling the amount of data transmission is one possible venue to save energy. In a number of LLN standards, the frame size is limited to much smaller values than the IPv6 maximum transmission unit (MTU) of 1280 bytes. In particular, an LLN that relies on the classical Physical Layer (PHY) of IEEE 802.15.4 [IEEE802154] is limited to 127 bytes per frame. The need to compress IPv6 packets over IEEE 802.15.4 led to the 6LoWPAN Header Compression [RFC6282] work (6LoWPAN-HC).

As more and more protocols need to be compressed, the encoding capabilities of the original dispatch defined in the 6lo adaptation layer framework ([RFC4944],[RFC6282]) becomes saturated. This specification introduces a new context switch mechanism for 6LoWPAN compression, expressed in terms of Pages and signaled by a new Paging Dispatch.

2. Terminology

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 [RFC2119].

The Terminology used in this document is consistent with and incorporates that described in `Terminology in Low power And Lossy Networks' [RFC7102] and [RFC7228].

3. Updating RFC 4944

This draft adapts 6LoWPAN while maintaining backward compatibility with IPv6 over IEEE 802.15.4 [RFC4944] by introducing a concept of "context" in the 6LoWPAN parser, a context being identified by a Page number. This specification defines 16 Pages.

Pages are delimited in a 6LoWPAN packet by a Paging Dispatch value that indicates the next current Page. The Page number is encoded in a Paging Dispatch with the Value Bit Pattern of 1111xxxx where xxxx is the Page number, 0 to 15, as described in Figure 1:

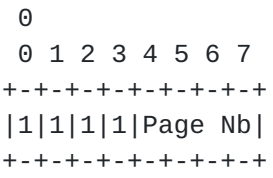

Figure 1: Paging Dispatch with Page Number Encoding.

Values of the Dispatch byte defined in [RFC4944] are considered as belonging to the Page 0 parsing context, which is the default and does not need to be signaled explicitly at the beginning of a 6LoWPAN packet. This ensures backward compatibility with existing implementations of 6LoWPAN.

Note: This specification does not use the Escape Dispatch, which extends Page 0 to more values, but rather allocates another Dispatch Bit Pattern (1111xxxx) for a new Paging Dispatch, that is present in all Pages, including Page 0 and Pages defined in future specifications, to indicate the next parsing context represented by its Page number. The rationale for avoiding that approach is that there can be multiple occurrences of a new header indexed by this specification in a single frame and the overhead on an octet each time for the Escape Dispatch would be prohibitive.

A Page (say Page N) is is said to be active once the Page N Paging Dispatch is parsed, and as long as no other Paging Dispatch is parsed.

The Dispatch bits defined in Page 0 by [RFC4944] are free to be reused in Pages 1 to 15.

4. Page 1 Paging Dispatch

This specification defines some special properties for Page 1, detailed below:

The Dispatch bits defined in Page 0 for the Compression Format for IPv6 Datagrams over IEEE 802.15.4-Based Networks [RFC6282] are defined with the same values in Page 1 so there is no need to switch context back from Page 1 to Page 0 to address LOWPAN_IPHC and LOWPAN_NHC.

Mesh Headers represent Layer-2 information and are processed before any Layer-3 information that is encoded in Page 1. If a 6LoWPAN packet requires a Mesh header, the Mesh Header MUST always be placed in the packet before the first Page 1 Paging Dispatch, if any.

For the same reason, Fragment Headers as defined in [RFC4944] MUST always be placed in the packet before the first Page 1 Paging Dispatch, if any.

The NALP Dispatch Bit Pattern as defined in [RFC4944] is only defined for the first octet in the packet. Switching back to Page 0 for NALP inside a 6LoWPAN packet does not make sense.

It results that there is no need so far for restoring the Page 0 parsing context after a context was switched to Page 1, so the value for the Page 0 Paging Dispatch of 11110000 may not actually be seen in packets following the 6LoWPAN specifications that are available at the time of writing.

5. Security Considerations

The security considerations of [RFC4944] and [RFC6282] apply.

6. IANA Considerations

This document creates a IANA registry for the 6LoWPAN Routing Header Type, and assigns the following values:

0..4 : RH3-6LoRH [RFCthis]

5 : RPI-6LoRH [RFCthis]

6 : IPinIP-6LoRH [RFCthis]

7. Acknowledgments

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8. References

8.1. Normative References

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8.2. Informative References

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