                      6LoWPAN Paging Dispatch
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Abstract

   This specification updates RFC 4944 to introduce a new context switch
   mechanism for 6LoWPAN compression, expressed in terms of Pages and
   signaled by a new Paging Dispatch.

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   This Internet-Draft will expire on January 21, 2017.

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1. Introduction

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

   Controlling the amount of data transmission is one possible means of
   saving 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 mechanism.

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 Terms Used in Routing for Low-Power
and Lossy Networks [RFC7102] and Terminology for Constrained-Node
Networks [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 a
"parsing 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:

```
                0
                0 1 2 3 4 5 6 7
              +-+-+-+-+-+-+-+-+
              |1|1|1|1|Page Nb|
              +-+-+-+-+-+-+-+-+
```

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.

The Dispatch bits defined in Page 0 by [RFC4944] are free to be
reused in Pages 1 to 15. This specification allocates some values in
Page 1 in Section 4 and leaves the rest open for future allocations.

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.

4. Page 1 Paging Dispatch

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

   The Dispatch bits defined for LOWPAN_IPHC by 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 from Page 1 to Page 0 to decode a packet
   that is encoded per [RFC6282].

   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.

   As a result, 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
   occur in those packets that adhere to 6LoWPAN specifications
   available at the time of writing this specification.

5. Security Considerations

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

6. IANA Considerations

6.1. Consuming Dispatch Types

   This document allocates 16 values from the Dispatch type field
   registry that was created for [RFC4944]. The allocated values are
   from 11 110000 through 11 111111 and represent Page Numbers 0 through
   15 as discussed in this document.

6.2. New Per-Page Dispatch Type registries

   This document creates 15 new IANA registries for the Per-Page
   Dispatch type fields, indexed by Page Number, 1 to 15. Each Registry
   corresponds to a bit-field of one octet.

   Future assignments in these registries are to be coordinated via IANA
   under the policy of "Specification Required" [RFC5226]. It is
   expected that this policy will allow for other (non-IETF)
   organizations to more easily obtain assignments.

   These registries extend the Dispatch type field registry that was
   created for [RFC4944], which is considered as the registry for Page
   0.

   As described above, this document allocates in the registry
   associated to Page 1 the Per-Page Dispatch type field values that are
   allocated in the Dispatch type field for LOWPAN_IPHC by [RFC6282].
   Those values are from 01 100000 through 01 111111 and they have the
   same definition in Page 1 as they do in Page 0, meaning that the
   registries for Page 0 and Page 1 are an exact overlap in this range.

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