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DLEP Control Plane Based Pause Extension
draft-ietf-manet-dlep-pause-extension-03

Abstract

   This document defines an extension to the DLEP protocol that enables
   a modem to use DLEP messages to pause and resume data traffic coming
   from its peer router.

Status of This Memo

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1. Introduction

The Dynamic Link Exchange Protocol (DLEP) is defined in [RFC8175].
It provides the exchange of link related control information between
DLEP peers. DLEP peers are comprised of a modem and a router. DLEP
defines a base set of mechanisms as well as support for possible
extensions. This document defines one such extension.

The base DLEP specification does not include any data plane flow
control capability. Various flow control methods are possible, e.g.,
see [I-D.ietf-manet-credit-window]. The extension defined in this
document supports flow control of data traffic based on explicit
messages sent via DLEP by a modem to indicate when a router should
hold off sending traffic, and when it should resume. The extension
also optionally supports DSCP (differentiated services codepoint)
aware, see [RFC2475], flow control. The extension defined in this
document is referred to as "Control Plane Based Pause". Note that
this mechanism only controls traffic that is to be transmitted on the
modem's attached data channel and not to DLEP control messages
themselves.

This document defines a new DLEP Extension Type Value in Section 2
which is used to indicate the use of the extension, and three new
DLEP Data Items in Section 3.

1.1. Key Words

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. Extension Usage and Identification

The use of the Control Plane Based Pause Extension SHOULD be configurable. To indicate that the Control Plane Based Pause Extension is to be used, an implementation MUST include the Control Plane Based Pause Extension Type Value in the Extensions Supported Data Item. The Extensions Supported Data Item is sent and processed according to [RFC8175].

The Control Plane Based Pause Extension Type Value is TBA1, see Section 5.

3. Extension Data Items

Three data items are defined by this extension. The Queue Parameters Data Item is used by a modem to provide information on the DSCPs it uses in forwarding. The Pause Data Item is used by a modem to indicate when a router should cease sending packets and the Restart Data Item is used by a modem to indicate when a router can resume sending packets.

3.1. Queue Parameters

The Queue Parameters Data Item is used by a modem to indicate DSCP values that may be independently paused. This data item MUST be included in a Session Initialization Response Message that also contains the Control Plane Based Pause Extension Type Value in the Extensions Supported Data Item. Updates to these parameters MAY be sent by a modem by including the data item in Session Update Messages.

The Queue Parameters Data Item identifies DSCPs based on groups of logical queues, each of which is referred to via a "Queue Index". The number of logical queues, or queue indexes, is variable as is the number of DSCPs associated with each queue. A queue size (in bytes) is provided for informational purposes. Queue Indexes are numbered sequentially from zero, where queue index zero is a special case covering DSCPs which are not otherwise associated with Queue Index.

An implementation that does not support DSCPs would indicate 1 queue
with 0 DSCPs, and the number of bytes that may be in its associated
link transmit queue. Additional logical queues are represented in a
variable series of Queue Parameter sub-data items.

The format of the Queue Parameters Data Item is:

```
  0                   1                   2                   3
  0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
 +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
 | Data Item Type                | Length                        |
 +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
 |   Num Queues  | Scale |               Reserved                |
 +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
 |  Reserved     |              Queue Size Q0                    |
 +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
 |              Queue Parameter Sub Data Item 1                  |
 +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
 :                            ...                                :
 +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
 |              Queue Parameter Sub Data Item n                  |
 +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

Data Item Type: TBA2

Length: Variable

   Per [RFC8175] Length is the number of octets in the data item,
   excluding the Type and Length fields.

Num Queues:

   An 8-bit unsigned integer indicating the number of queues
   represented in the data item. This field MUST contain a value of
   at least one (1), and is equal to one greater than the number of
   included Queue Parameter Sub Data Items.

Scale:

   An 4-bit unsigned integer indicating the scale used in the Queue
   Size fields. The valid values are:

```
    Value  Scale
    ------------
       0   B - Bytes     (Octets)
       1  KB - Kilobytes (B/1024)
       2  MB - Megabytes (KB/1024)
       3  GB - Gigabytes (MB/1024)
```

   Reserved:

      MUST be set to zero by the sender (a modem) and ignored by the
      receiver (a router).

   Queue Size Q0:

      A 24-bit unsigned integer representing the size, in the octet
      scale indicated by the Scale field, of queue index zero.

3.1.1. Queue Parameter Sub Data Item

   Queue Parameter Sub Data Items are an ordered list composed of sub
   data items with a common format. The first sub data item is assigned
   a Queue Index value of 1, and subsequent data items are numbered
   incrementally. The format of the Queue Parameter Sub Data Item is
   patterned after the standard DLEP data item format, see [RFC8175]
   Section 11.3. Any errors or inconsistencies encountered in parsing
   Sub Data Items are handled in the same fashion as any other Data Item
   parsing error encountered in DLEP.

   The format of the Queue Parameter Sub Data Item is:

```
    0                   1                   2                   3
    0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   | Must be one (1)               | Length                        |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |                             Value...                          :
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

   and Value has the format:

```
    0                   1                   2                   3
    0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   | Num DSCPs Qn  |            Queue Size Qn                      |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |  DS Field Qn  | DS Field Qn  |           ...                 :
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   :                           ...                 | DS Field Qn  |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

   Length: Variable

      Copying [RFC8175], Length is the number of octets in the sub data
      item, excluding the Type and Length fields.

Num DSCPs Qn:

   An 8-bit unsigned integer indicating the number of DSCPs
   associated with the queue index associated with the sub data item.
   This field MUST contain a value of at least one (1).

Queue Size Qn:

   A 24-bit unsigned integer representing the size, in the octet
   scale indicated by the Scale field, of the queue supporting
   traffic with the DSCPs associated with the queue index.

DS Field Qn:

   The data item contains a sequence of 8 bit DS Fields. The
   position in the sequence identifies the associated queue index.
   The number of DS Fields present should equal the sum of all Num
   DSCPs field values.

   The DS Field structure is the same as [RFC2474].

```
       0   1   2   3   4   5   6   7
     +---+---+---+---+---+---+---+---+
     |          DSCP         | CU    |
     +---+---+---+---+---+---+---+---+

       DSCP: differentiated services codepoint
       CU:   currently unused, MUST be zero
```

3.2. Pause

   The Pause Data Item is used by a modem to indicate to its peer that
   traffic is to be suppressed. An example of when a modem might send
   this data item is when an internal queue length exceeds a particular
   threshold.

   A modem may indicate that traffic is to be suppressed on a device
   wide or destination specific basis. An example of when a modem might
   use device wide indications is when output queues are shared across
   all destinations, and destination specific might be used when per
   destination queuing is used. To indicate that suppression applies to
   all destinations, a modem MAY send the Pause Data Item in a Session
   Update Message. To indicate that suppression applies to a particular
   destination a modem MAY send the Pause Data Item in a Destination
   Update Message.

   Each Pause Data Item identifies the traffic to be suppressed by the
   Queue Index defined by Section 3.1, which in turn indicates a set of

   traffic identified by DSCPs. The special value of 255 is used to
   indicate that all traffic is to be suppressed.

   While there is no restriction on the number of Messages containing
   Pause Data Item that may be sent by a modem, a modem SHOULD include
   multiple queue indexes in the same message when possible.

   A router which receives the Pause Data Item MUST cease sending the
   identified traffic to the modem. This may of course translate into
   the router's queues exceeding their own thresholds. If a received
   Pause Data Item contains a Queue Index value other than 0, 255, or a
   queue index established by a Session Initialization or Session Update
   Message, the router MUST terminate the session with a Status Data
   Item indicating Invalid Data.

   The format of the Pause Data Item is:

```
     0                   1                   2                   3
     0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
    +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
    | Data Item Type                | Length                        |
    +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
    |  Queue Index  |               ...                             :
    +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
    :                               ...             | Queue Index   |
    +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

   Data Item Type: TBA3

   Length: Variable

      Per [RFC8175] Length is the number of octets in the data item,
      excluding the Type and Length fields. It will equal the number of
      Queue Index fields carried in the data item.

   Queue Index:

      One or more 8-bit fields used to indicate a queue index defined by
      a Queue Parameters Data Item. The special value of 255 indicates
      all traffic is to be suppressed to the modem, when the data item
      is carried in a Session Update Message, or a destination, when the
      data item is carried in Destination Update Message.

3.3. Restart

   The Restart Data Item is used by a modem to indicate to its peer that
   transmission of previously suppressed traffic may be resumed. An

example of when a modem might send this data item is when an internal
queue length drops below a particular threshold.

The sending of this data item parallels the Pause Data Item, see the
previous section, and follows the same rules. This includes that to
indicate that transmission can resume to all destinations, a modem
MAY send the Restart Data Item in a Session Update Message. It also
includes that to indicate that transmission can resume to a
particular destination a modem MAY send the Pause Restart Item in a
Destination Update Message. Finally, the same rules apply to queue
indexes.

A router which receives the Restart Data Item SHOULD resume
transmission of the identified traffic to the modem.

The format of the Restart Data Item matches the Pause Data Item and
is:

```
 0                   1                   2                   3
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
| Data Item Type                | Length                        |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|  Queue Index  |               ...                             :
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
:                           ...                 |  Queue Index  |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

Data Item Type: TBA4

Length: See Section 3.2.

Queue Index: See Section 3.2.

4. Security Considerations

The extension introduces a new mechanism for flow control between a
router and modem using the DLEP protocol. The extension does not
inherently introduce any additional threats above those documented in
[RFC8175]. The approach taken to Security in that document applies
equally when running the extension defined in this document.

5. IANA Considerations

This document requests the assignment of 4 values by IANA. All
assignments are to registries defined by [RFC8175].

5.1. Extension Type Value

   This document requests 1 new assignment to the DLEP Extensions
   Registry named "Extension Type Values" in the range with the
   "Specification Required" policy. The requested value is as follows:

```
          +------+---------------------------+
          | Code | Description               |
          +------+---------------------------+
          | TBA1 | Control Plane Based Pause |
          +------+---------------------------+
```

                 Table 1: Requested Extension Type Value

5.2. Data Item Values

   This document requests 3 new assignments to the DLEP Data Item
   Registry named "Data Item Type Values" in the range with the
   "Specification Required" policy. The requested values are as
   follows:

```
          +-----------+------------------+
          | Type Code | Description      |
          +-----------+------------------+
          | TBA2      | Queue Parameters |
          |           |                  |
          | TBA3      | Pause            |
          |           |                  |
          | TBA4      | Restart          |
          +-----------+------------------+
```

                   Table 2: Requested Data Item Values

6. References

6.1. Normative References

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6.2. Informative References

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   [RFC2475] Blake, S., Black, D., Carlson, M., Davies, E., Wang, Z.,
              and W. Weiss, "An Architecture for Differentiated
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Appendix A. Acknowledgments

   The sub data item format was inspired by Rick Taylor's "Data Item
   Containers".

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