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DLEP Control Plane Based Pause Extension
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Abstract

This document defines an extension to the DLEP protocol that enables a simple control plane based flow control mechanism.

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[1.](#) Introduction

The Dynamic Link Event Protocol (DLEP) is defined in [\[I-D.ietf-manet-dlep\]](#). 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 flow control capability. There are various flow control possible, e.g., see [\[I-D.ietf-manet-credit-window\]](#). The extension defined in this document supports flow control 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 Pause".

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

2. Extension Usage and Identification

The use of the Control Plane Pause Extension SHOULD be configurable. To indicate that the Control Plane Pause Extension is to be used, an implementation MUST include the Control Plane Pause Extension Type Value in the Extensions Supported Data Item. The Extensions Supported Data Item is sent and processed according to [[I-D.ietf-manet-dlep](#)].

The Control Plane 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.

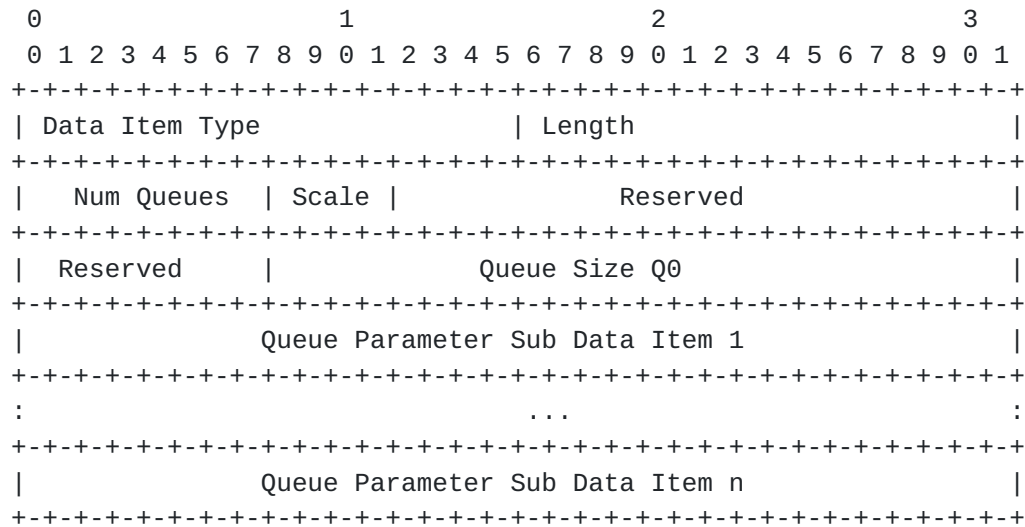
3.1. Queue Parameters

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 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:



Data Item Type: TBA2

Length: Variable

Per [[I-D.ietf-manet-dlep](#)] 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 Item.

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 the identical format sub data item. The first sub data item is assigned a Queue Index value of 1, and subsequent data item are numbered incrementally. The format of the Queue Parameter Sub Data Item is patterned after the standard DLEP data item format, see [I-D.ietf-manet-dlep] [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

Per [I-D.ietf-manet-dlep] Length is the number of octets in the 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.

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 [[I-D.ietf-manet-dlep](#)] 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 [\[I-D.ietf-manet-dlep\]](#). 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 [\[I-D.ietf-manet-dlep\]](#).

5.1. Extension Type Value

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

Code	Description
TBA1	Control Plane 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 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

- [I-D.ietf-manet-dlep]
 Ratliff, S., Jury, S., Satterwhite, D., Taylor, R., and B. Berry, "Dynamic Link Exchange Protocol (DLEP)", [draft-ietf-manet-dlep-29](#) (work in progress), March 2017.
- [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", [BCP 14](#), [RFC 2119](#), DOI 10.17487/RFC2119, March 1997, <<http://www.rfc-editor.org/info/rfc2119>>.

6.2. Informative References

- [I-D.ietf-manet-credit-window]
 Ratliff, S., "Credit Windowing extension for DLEP", [draft-ietf-manet-credit-window-07](#) (work in progress), November 2016.

- [RFC2474] Nichols, K., Blake, S., Baker, F., and D. Black, "Definition of the Differentiated Services Field (DS Field) in the IPv4 and IPv6 Headers", [RFC 2474](http://www.rfc-editor.org/info/rfc2474), DOI 10.17487/RFC2474, December 1998, <<http://www.rfc-editor.org/info/rfc2474>>.
- [RFC2475] Blake, S., Black, D., Carlson, M., Davies, E., Wang, Z., and W. Weiss, "An Architecture for Differentiated Services", [RFC 2475](http://www.rfc-editor.org/info/rfc2475), DOI 10.17487/RFC2475, December 1998, <<http://www.rfc-editor.org/info/rfc2475>>.

Appendix A. Acknowledgments

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

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