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D. Wiggins  
MIT Lincoln Laboratory  
L. Berger  
LabN Consulting, L.L.C.  
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DLEP IEEE 802.1Q Aware Credit Window Extension  
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Abstract

This document defines an extension to the Dynamic Link Exchange Protocol (DLEP) that enables a Ethernet IEEE 802.1Q aware credit-window scheme for destination-specific and shared flow control.

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## Table of Contents

1. Introduction . . . . .	2
1.1. Key Words . . . . .	3
2. Extension Usage and Identification . . . . .	3
3. Management Considerations . . . . .	4
4. Security Considerations . . . . .	4
5. IANA Considerations . . . . .	5
5.1. Extension Type Value . . . . .	5
6. References . . . . .	5
6.1. Normative References . . . . .	5
6.2. Informative References . . . . .	6
Appendix A. Acknowledgments . . . . .	6
Authors' Addresses . . . . .	6

## 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 flow control capability. There are various flow control techniques theoretically possible with DLEP. This document defines a DLEP extension which provides an Ethernet-based flow control mechanism for traffic sent from a router to a modem. Flow control is provided using one or more logical "Credit Windows", each of which will typically be supported by an associated virtual or physical queue. A router will use traffic flow classification information provided by the modem to identify which traffic is associated with each credit window. Credit windows may be shared or dedicated on a per flow basis. See [I-D.ietf-manet-dlep-da-credit-extension] for a DiffServ-based version of credit window flow control.

This document uses the traffic classification and credit window control mechanisms defined in [I-D.ietf-manet-dlep-traffic-classification] and [I-D.ietf-manet-dlep-credit-flow-control] to provide credit window based flow control based on DLEP destinations and Ethernet VLANs and Priority Code Points. Ethernet Priority Code Point support is defined as part of the IEEE 802.1Q [IEEE.802.1Q\_2014] tag format and includes a 3 bit "PCP" field. The tag format also includes a 12 bit VLAN identifier (VID) field. The defined mechanism allows for credit windows to be shared across traffic sent to multiple DLEP destinations, VLANs, and PCPs, or used exclusively for traffic sent to a particular destination and/or VLAN and/or PCP. The extension also supports the "wildcard" matching of any PCP or VID.

The extension defined in this document is referred to as "IEEE 802.1Q Aware Credit Window" or, more simply, the "Ethernet Credit" extension. The reader should be familiar with both the traffic classification and credit window control mechanisms defined in [I-D.ietf-manet-dlep-traffic-classification] and [I-D.ietf-manet-dlep-credit-flow-control].

This document defines a new DLEP Extension Type Value in Section 2 which is used to indicate support for the extension.

### 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 extension defined in this document is composed of the mechanisms and processing defined in [I-D.ietf-manet-dlep-traffic-classification] and [I-D.ietf-manet-dlep-credit-flow-control]. To indicate that the IEEE 802.1Q Aware Credit Window Extension is to be used, an implementation MUST include the IEEE 802.1Q Aware Credit Window Type Value in the Extensions Supported Data Item. The Extensions Supported Data Item is sent and processed according to [RFC8175]. Any implementation that indicates use of the IEEE 802.1Q Aware Credit Window Extension MUST support all Messages, Data Items, the Ethernet Traffic Classification Sub-Data Item, and all related processing defined in [I-D.ietf-manet-dlep-traffic-classification] and [I-D.ietf-manet-dlep-credit-flow-control].

The IEEE 802.1Q Aware Credit Window Extension Type Value is TBA1, see Section 5.

### 3. Management Considerations

This section provides several network management guidelines to implementations supporting the IEEE 802.1Q Aware Credit Window Extension.

The use of the extension defined in this document SHOULD be configurable on both modems and routers.

Modems SHOULD support the configuration of PCP to credit window (queue) mapping.

Modems MAY support the configuration of PCP to credit window (queue) mapping on a per VLAN basis. Note that VID value of zero (0) is used by [I-D.ietf-manet-dlep-traffic-classification] to indicate that VID is ignored and any VID value is used in traffic classification.

When VLANs are supported by a modem without support from PCPs, the modem SHOULD support the configuration of VLAN to credit window (queue) mapping.

Modems MAY support the configuration of the number of credit windows (queues) to advertise to a router.

Routers may have limits on the number of queues that they can support and, perhaps, even limits in supported credit window combinations, e.g., if per destination queues can even be supported at all. When modem-provided credit window information exceeds the capabilities of a router, the router MAY use a subset of the provided credit windows. Alternatively, a router MAY reset the session and indicate that the extension is not supported. In either case, the mismatch of capabilities SHOULD be reported to the user via normal network management mechanisms, e.g., user interface or error logging.

### 4. Security Considerations

This document defines a DLEP extension that uses base DLEP mechanisms and the credit window control and flow mechanisms defined in [I-D.ietf-manet-dlep-traffic-classification] and [I-D.ietf-manet-dlep-credit-flow-control]. The use of those mechanisms, and the introduction of a new extension, do not inherently introduce any additional vulnerabilities above those documented in [RFC8175]. The approach taken to Security in that document applies equally to the mechanism defined in this document.

## 5. IANA Considerations

This document requests one assignment 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	IEEE 802.1Q Aware Credit Window

Table 1: Requested Extension Type Value

## 6. References

### 6.1. Normative References

- [I-D.ietf-manet-dlep-credit-flow-control]  
Cheng, B., Wiggins, D., Berger, L., and S. Ratliff, "DLEP Credit-Based Flow Control Messages and Data Items", Work in Progress, Internet-Draft, draft-ietf-manet-dlep-credit-flow-control-08, 21 June 2021, <<https://www.ietf.org/archive/id/draft-ietf-manet-dlep-credit-flow-control-08.txt>>.
- [I-D.ietf-manet-dlep-traffic-classification]  
Cheng, B., Wiggins, D., and L. Berger, "DLEP Traffic Classification Data Item", Work in Progress, Internet-Draft, draft-ietf-manet-dlep-traffic-classification-05, 21 June 2021, <<https://www.ietf.org/archive/id/draft-ietf-manet-dlep-traffic-classification-05.txt>>.
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IEEE, "IEEE Standard for Local and metropolitan area networks--Bridges and Bridged Networks", IEEE 802.1Q-2014, DOI 10.1109/ieeestd.2014.6991462, 18 December 2014, <<http://ieeexplore.ieee.org/servlet/opac?punumber=6991460>>.

- [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, DOI 10.17487/RFC2119, March 1997, <<https://www.rfc-editor.org/info/rfc2119>>.
- [RFC8174] Leiba, B., "Ambiguity of Uppercase vs Lowercase in RFC 2119 Key Words", BCP 14, RFC 8174, DOI 10.17487/RFC8174, May 2017, <<https://www.rfc-editor.org/info/rfc8174>>.
- [RFC8175] Ratliff, S., Jury, S., Satterwhite, D., Taylor, R., and B. Berry, "Dynamic Link Exchange Protocol (DLEP)", RFC 8175, DOI 10.17487/RFC8175, June 2017, <<https://www.rfc-editor.org/info/rfc8175>>.

## 6.2. Informative References

- [I-D.ietf-manet-dlep-da-credit-extension]  
Cheng, B., Wiggins, D., and L. Berger, "DLEP DiffServ Aware Credit Window Extension", Work in Progress, Internet-Draft, draft-ietf-manet-dlep-da-credit-extension-11, 21 June 2021, <<https://www.ietf.org/archive/id/draft-ietf-manet-dlep-da-credit-extension-11.txt>>.

## Appendix A. Acknowledgments

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## Authors' Addresses

David Wiggins  
MIT Lincoln Laboratory  
Massachusetts Institute of Technology  
244 Wood Street  
Lexington

Email: [David.Wiggins@ll.mit.edu](mailto:David.Wiggins@ll.mit.edu)

Lou Berger  
LabN Consulting, L.L.C.

Email: [lberger@labn.net](mailto:lberger@labn.net)