

Delay/Disruption Tolerant Networking
Internet-Draft
Intended status: Informational
Expires: 16 September 2026

E. Kline
Aalyria Technologies, Inc.
15 March 2026

Assignment of Ethernet Parameters for Bundle Transfer Protocol -
Unidirectional (BTP-U) over Ethernet
draft-ek-dtn-ethernet-04

Abstract

This memo requests allocation of an EtherType and multicast MAC address for Bundle Transfer Protocol - Unidirectional (BTP-U) to enable its use as a Convergence Layer on Ethernet networks. This provides an alternative to IP-based convergence layers for environments where Ethernet forwarding is operationally feasible but IP routing is unavailable or operationally undesirable.

About This Document

This note is to be removed before publishing as an RFC.

The latest revision of this draft can be found at <https://ekline.github.io/draft-dtn-ethernet/draft-ek-dtn-ethernet.html>. Status information for this document may be found at <https://datatracker.ietf.org/doc/draft-ek-dtn-ethernet/>.

Discussion of this document takes place on the Delay/Disruption Tolerant Networking Working Group mailing list (<mailto:dtn@ietf.org>), which is archived at <https://mailarchive.ietf.org/arch/browse/dtn/>. Subscribe at <https://www.ietf.org/mailman/listinfo/dtn/>.

Source for this draft and an issue tracker can be found at <https://github.com/ekline/draft-dtn-ethernet>.

Status of This Memo

This Internet-Draft is submitted in full conformance with the provisions of BCP 78 and BCP 79.

Internet-Drafts are working documents of the Internet Engineering Task Force (IETF). Note that other groups may also distribute working documents as Internet-Drafts. The list of current Internet-Drafts is at <https://datatracker.ietf.org/drafts/current/>.

Internet-Drafts are draft documents valid for a maximum of six months and may be updated, replaced, or obsoleted by other documents at any time. It is inappropriate to use Internet-Drafts as reference material or to cite them other than as "work in progress."

This Internet-Draft will expire on 16 September 2026.

Copyright Notice

Copyright (c) 2026 IETF Trust and the persons identified as the document authors. All rights reserved.

This document is subject to BCP 78 and the IETF Trust's Legal Provisions Relating to IETF Documents (<https://trustee.ietf.org/license-info>) in effect on the date of publication of this document. Please review these documents carefully, as they describe your rights and restrictions with respect to this document. Code Components extracted from this document must include Revised BSD License text as described in Section 4.e of the Trust Legal Provisions and are provided without warranty as described in the Revised BSD License.

Table of Contents

| | |
|--|----|
| 1. Introduction | 3 |
| 2. Applicability and Limitations | 3 |
| 2.1. BTP-U Protocol Compliance | 3 |
| 2.2. BTP-U Virtual Channels | 3 |
| 2.3. Congestion Control | 4 |
| 2.4. Relationship to IP-based Convergence Layers | 4 |
| 3. Conventions and Definitions | 5 |
| 4. Assignment Considerations | 5 |
| 4.1. IEEE Assignment Considerations | 5 |
| 4.1.1. EtherType | 5 |
| 4.2. IANA Considerations | 6 |
| 4.2.1. Multicast MAC Address | 6 |
| 5. Operational Considerations | 6 |
| 5.1. Checksums | 6 |
| 5.2. MTU and Jumbo Frames | 6 |
| 6. Security Considerations | 7 |
| 6.1. Denial of Service | 7 |
| 6.2. Link-layer Security | 7 |
| 6.3. Packet Reordering, Duplication, and Replay | 7 |
| 6.4. Filtering | 8 |
| 7. References | 8 |
| 7.1. Normative References | 8 |
| 7.2. Informative References | 8 |
| Acknowledgments | 9 |
| Author's Address | 10 |

1. Introduction

This memo requests Ethernet parameters to enable BTP-U [BTP-U] as a Convergence Layer for environments where Bundle Protocol nodes are connected by Ethernet or Ethernet-like technologies. Specifically:

- * an EtherType to identify frames carrying BTP-U payloads (4.1.1)
- * a multicast MAC address for neighbor discovery and announcements (4.2.1)

This convergence layer is applicable to:

- * Physical Ethernet LANs
- * Virtual Private Cloud (VPC) networks connecting Bundle Protocol Agents
- * Ground-Station-as-a-Service (GSaaS) infrastructure
- * Technologies supporting Ethernet framing, e.g., DVB-GSE ([DVB-GSE]), 3GPP 5G Ethernet PDU Session types ([_3GPP-TS-23.501] 則 5.6.10.2), and the US Space Development Agency's Optical Communications Terminal standard ([SDA-OCT] 則 3.4.8).

Primary use cases include mission modeling, testbed environments, and deployments where IP routing is unavailable or adds unnecessary complexity.

2. Applicability and Limitations

2.1. BTP-U Protocol Compliance

This document specifies Ethernet encapsulation for [BTP-U]. All protocol requirements, features, and recommendations defined in [BTP-U] apply to this Ethernet profile.

Implementations MUST implement all mandatory [BTP-U] features and SHOULD implement all recommended features, including [BTP-U] Segmentation for handling Bundles that exceed the Ethernet MTU.

2.2. BTP-U Virtual Channels

[BTP-U] Transfer Numbers are unique within a "virtual channel." For Ethernet, the virtual channel is identified by:

- * Source MAC address (6 octets)

- * Destination MAC address (6 octets)
- * C-VLAN ID (12 bits, if 802.1Q tag present)

Each unique combination defines a separate virtual channel with independent Transfer Number sequencing.

Other technologies that support Ethernet-like framing and use of this EtherType (4.1.1) but which lack the above virtual channel identifiers MUST define the equivalent virtual channel identifiers, e.g. technology-specific source and/or destination as well as any protocol-specific channel discriminators.

When using the multicast MAC address (4.2.1) for transmitting to receivers whose MAC addresses have not yet been learned, all receivers in the broadcast domain share the same destination address (and therefore the same virtual channel). Receiving Bundle Protocol Agents validate the Bundle destination EID, to determine whether received bundles are intended for local processing. Once a sender learns a peer's MAC address, implementations SHOULD switch to unicast transmission so as to minimize processing overhead by other listeners.

2.3. Congestion Control

BTP-U lacks a congestion control mechanism and presumes sending rate is externally managed. Ethernet flow control mechanisms exist but, may not be operationally applicable in all situations (e.g. high delay links).

For deployments where congestion control cannot be managed by a mechanism outside of BTP-U, network operators MUST consider alternate Convergence Layers.

2.4. Relationship to IP-based Convergence Layers

IP-based convergence layers (TCPCL [TCPCL], UDPCLv2 [UDPCLv2]) remain recommended where IP infrastructure exists. This Ethernet convergence layer addresses scenarios where:

- * no operational IP addressing or routing is available
- * only IPv4 or IPv6 link-local addresses exist and peer discovery is unspecified
- * direct Ethernet operation simplifies deployment and management

Header overhead savings (28-48+ bytes) are secondary to operational utility in non-IP environments.

3. Conventions and Definitions

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.

As this memo is Informational it uses BCP14 language only for clarity.

4. Assignment Considerations

Allocation of the following Ethernet parameters is requested.

4.1. IEEE Assignment Considerations

4.1.1. EtherType

(per [RFC9542]) The IESG is requested to approve applying to the IEEE Registration Authority for an EtherType for BTP-U. (The IESG should communicate its approval to IANA and to those concerned with this document. IANA will forward the IESG Approval to the registry expert of the "EtherType" registry from the "IEEE 802 Numbers" registry group who will make the application to the IEEE Registration Authority, keeping IANA informed.)

(if approved) The following entry has been added to the "ETHER TYPES" subregistry of the "IEEE 802 Numbers" registry [IANA-IEEE802]:

Ethertype (decimal): YYYY

Ethertype (hex): YYYY

Exp. Ethernet (decimal): -

Exp. Ethernet (octal): -

Description: BTP-U payloads

References: RFC ZZZZ (this document)

4.2. IANA Considerations

4.2.1. Multicast MAC Address

One multicast MAC address is requested to enable neighbor discovery and Bundle availability announcements within a broadcast domain. This allows BTP-U senders to reach all capable receivers without prior knowledge of individual MAC addresses.

Following the recommended format given as the EUI-48 Identifier template in [RFC9542]:

Applicant Name: IETF DTN Working Group

Applicant Email: dtn@ietf.org

Applicant Telephone: (none)

Use Name: Bundle Transfer Protocol - Unidirectional

Document: [BTP-U]

This memo is an application for one multicast EUI-48 identifier.

5. Operational Considerations

5.1. Checksums

To reiterate the observation in 則 3.5 of [DGRAMCL], the Bundle Protocol specifications assume that Bundles "are transmitted over an erasure channel, i.e., a channel that either delivers packets correctly or not at all".

Ethernet's Frame Check Sequence (FCS) minimally meets this requirement to ensure Bundles are not corrupted in transmission. Use of stronger integrity checks are left to BTP-U and its extensions.

5.2. MTU and Jumbo Frames

Implementations MUST support transmission and reception of frames with payload sizes up to 1500 octets (standard Ethernet MTU minus Ethernet header), as required by [IEEE802dot3].

Implementations MAY support jumbo frames with payload sizes up to 9000 octets or larger, but SHOULD only enable this capability when explicitly configured where operators have verified that the network path supports the larger frame size.

Since [BTP-U] has no path MTU discovery mechanism and Ethernet networks silently drop oversized frames, implementations SHOULD default to 1500 octets. Link Layer Discovery Protocol (LLDP) MAY be used to discover directly-connected link and neighbor parameters.

6. Security Considerations

This document requests assignment of an EtherType and Multicast MAC address for BTP-U datagrams. It has no incremental implications for security beyond those already documented in [BPv7] and [BTP-U].

6.1. Denial of Service

BTP-U assumes the sending rate is controlled by a mechanism out of scope for the protocol and has no built-in mechanism for identifying or mitigating any congestion a sender might cause. Use of this protocol on some networks, a shared LAN segment for example, may cause a Denial-of-Service by flooding Ethernet switches and stations.

6.2. Link-layer Security

Any attacker with access to the link, or with sufficient knowledge of local Bundle forwarding configuration so as to inject BTP-U frames and cause them to be sent to an Ethernet peer, may overwhelm the receiver to the point of Denial of Service to other onlink senders.

IEEE standards include several security mechanisms that may be used in Ethernet networks. Examples of recommended Ethernet-level security mechanisms a network might deploy include: IEEE 802.1X ([IEEE802dot1X]), which may be used restrict access to the link to authorized participants, and IEEE 802.1AE ([IEEE802dot1AE]), which offers confidentiality of the entire BTP-U payload. In some deployments, and link may be considered secure against on-link attackers by virtue of its architecture, e.g. in cloud networking configurations where access to the virtual link is the responsibility of cloud security functions.

6.3. Packet Reordering, Duplication, and Replay

Packet reordering and duplicaton are handled by the BTP-U protocol. However, an on-link attacker may replay traffic to effectively repeat a Bundle transfer. Even if a link can be made secure (6.2) repeat delivery of specific Bundles may happen for other reasons. Duplicate Bundle detection is handled by the Bundle Protocol Agent as specified in [BPv7] using the Bundle's unique identifier (source node ID and creation timestamp). This mechanism operates independently of the convergence layer.

6.4. Filtering

A common security paradigm is to "default deny" all traffic patterns that, broadly, do not conform to operator expectations. In such environments the BTP-U EtherType needs to be explicitly permitted to be used on a given Ethernet segment before BTP-U messages can be successfully transmitted.

7. References

7.1. Normative References

- [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/rfc/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/rfc/rfc8174>>.

7.2. Informative References

- [BPv7] Burleigh, S., Fall, K., and E. Birrane, III, "Bundle Protocol Version 7", RFC 9171, DOI 10.17487/RFC9171, January 2022, <<https://www.rfc-editor.org/rfc/rfc9171>>.
- [BTP-U] Taylor, R., "Bundle Transfer Protocol - Unidirectional", Work in Progress, Internet-Draft, draft-ietf-dtn-btpu-02, 17 February 2026, <<https://datatracker.ietf.org/doc/html/draft-ietf-dtn-btpu-02>>.
- [DGRAMCL] Kruse, H., Jero, S., and S. Ostermann, "Datagram Convergence Layers for the Delay- and Disruption-Tolerant Networking (DTN) Bundle Protocol and Licklider Transmission Protocol (LTP)", RFC 7122, DOI 10.17487/RFC7122, March 2014, <<https://www.rfc-editor.org/rfc/rfc7122>>.
- [DVB-GSE] ETSI, "Digital Video Broadcasting (DVB); Generic Stream Encapsulation (GSE) Protocol", ETSI TS 102 606, October 2007.
- [IANA-IEEE802] IANA, "IEEE 802 Numbers", n.d., <<https://www.iana.org/assignments/ieee-802-numbers/>>.

[IEEE802dot1AE]

IEEE, "IEEE Standard for Local and Metropolitan Area Networks--Media Access Control (MAC) Security", IEEE Std 802.1AE-2018, December 2018.

[IEEE802dot1X]

IEEE, "IEEE Standard for Local and Metropolitan Area Networks--Port-Based Network Access Control", IEEE Std 802.1X-2020, February 2020.

[IEEE802dot3]

IEEE, "IEEE Standard for Ethernet", IEEE Std 802.3-2018, August 2018,
<https://standards.ieee.org/standard/802_3-2018.html>.

[RFC9542]

Eastlake 3rd, D., Abley, J., and Y. Li, "IANA Considerations and IETF Protocol and Documentation Usage for IEEE 802 Parameters", BCP 141, RFC 9542, DOI 10.17487/RFC9542, April 2024,
<<https://www.rfc-editor.org/rfc/rfc9542>>.

[SDA-OCT]

Space Development Agency, "Optical Communications Terminal (OCT) Standard", SDA OCT Standard Version 4.0.0, July 2024, <https://www.sda.mil/wp-content/uploads/2024/07/SDA_OCT_Standard_4.0.0_final-20240701.pdf>.

[TCPCL]

Sipos, B., Demmer, M., Ott, J., and S. Perreault, "Delay-Tolerant Networking TCP Convergence-Layer Protocol Version 4", RFC 9174, DOI 10.17487/RFC9174, January 2022,
<<https://www.rfc-editor.org/rfc/rfc9174>>.

[UDPCLv2]

Sipos, B. and J. Deaton, "Delay-Tolerant Networking UDP Convergence Layer Protocol Version 2", Work in Progress, Internet-Draft, draft-ietf-dtn-udpcl-03, 17 December 2025,
<<https://datatracker.ietf.org/doc/html/draft-ietf-dtn-udpcl-03>>.

[_3GPP-TS-23.501]

3GPP, "System Architecture for the 5G System (5GS)", 3GPP TS 23.501 V15.2.0, June 2018,
<https://www.3gpp.org/ftp/Specs/archive/23_series/23.501/>.

Acknowledgments

Thanks to Wes Eddy, Jeorg Ott, Brian Sipos, and Rick Taylor for numerous discussions and contributions.

Author's Address

Erik Kline
Aalyria Technologies, Inc.
Email: ek.ietf@gmail.com