

Delay-Tolerant Networking Working Group
Internet Draft
Intended status: Standards Track
Expires: September 2019

S. Burleigh
JPL, Calif. Inst. Of Technology
April 23, 2019

Minimal TCP Convergence-Layer Protocol
draft-ietf-dtn-mtcpcl-01.txt

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), its areas, and its working groups. Note that other groups may also distribute working documents as Internet-Drafts.

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."

The list of current Internet-Drafts can be accessed at <http://www.ietf.org/ietf/1id-abstracts.txt>

The list of Internet-Draft Shadow Directories can be accessed at <http://www.ietf.org/shadow.html>

This Internet-Draft will expire on October 25, 2019.

Copyright Notice

Copyright (c) 2019 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 (<http://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 Simplified BSD License text as described in Section 4.e of the [Trust Legal Provisions](#) and are provided without warranty as described in the Simplified BSD License.

Abstract

This document describes a Minimal TCP (MTCP) "convergence-layer" protocol for the Delay-Tolerant Networking (DTN) Bundle Protocol (BP). MTCP uses Transmission Control Protocol (TCP) to transmit BP "bundles" from one BP node to another node to which it is topologically adjacent in the BP network. The services provided by the MTCP convergence-layer protocol adapter utilize a standard TCP connection for the purposes of bundle transmission.

Table of Contents

1. Introduction.....	2
2. Conventions used in this document.....	3
3. MTCP Design Elements.....	3
3.1. MTCP Sessions.....	3
3.2. MTCP Protocol Data Units.....	4
4. MTCP Procedures.....	4
4.1. MPDU Transmission.....	4
4.2. Reception Session Formation.....	5
4.3. MPDU Reception.....	5
5. Security Considerations.....	5
6. IANA Considerations.....	6
7. References.....	6
7.1. Normative References.....	6
7.2. Informative References.....	7
8. Acknowledgments.....	7
Appendix A. For More Information.....	8

1. Introduction

This document describes the Minimal TCP (MTCP) protocol, a Delay-Tolerant Networking (DTN) Bundle Protocol (BP) [[RFC5050](#)] "convergence layer" protocol that uses a standard TCP connection to transmit bundles from one BP node to another node to which it is topologically adjacent in the BP network.

Conformance to the MTCP convergence-layer protocol specification is OPTIONAL for BP nodes.

Each BP node that conforms to the MTCP specification includes an MTCP convergence-layer adapter (MCLA). Every MCLA engages in communication via the Transmission Control Protocol [[RFC0793](#)].

Like any convergence-layer adapter, the MTCP CLA provides:

- . A transmission service that sends an outbound bundle (from the bundle protocol agent) to a peer CLA via the MTCP convergence layer protocol.
- . A reception service that delivers to the bundle protocol agent an inbound bundle that was sent by a peer CLA via the MTCP convergence layer protocol.

Transmission of bundles via MTCP is "reliable" to the extent that TCP itself is reliable. MTCP provides no supplementary error detection and recovery procedures. In particular, MTCP does not provide to the sender any interim reporting of reception progress.

2. Conventions used in this document

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [RFC-2119](#) [[RFC2119](#)].

In this document, these words will appear with that interpretation only when in ALL CAPS. Lower case uses of these words are not to be interpreted as carrying [RFC-2119](#) significance.

3. MTCP Design Elements

3.1. MTCP Sessions

An MTCP "session" is formed when a TCP connection is established by the matching of an active TCP OPEN request issued by some MCLA, termed the session's "sender", with a passive TCP OPEN request issued by some MCLA, termed the session's "receiver". That portion of the state of a session that is exposed to the session's sender is termed the "transmission element" of the session. That portion of the state of a session that is exposed to the session's receiver is termed the "reception element" of the session.

The values of the parameters constraining MTCP's TCP connection establishment, including the establishment of Transport Layer Security (TLS; [RFC8446](#)) sessions within the connections, SHALL be provided by management, by means that are beyond the scope of this specification. No TCP port number will be reserved for MTCP connection purposes.

The use of TLS to secure MTCP sessions is optional but is strongly recommended. When it is determined, by management, that an MTCP session between a given sender and receiver is to be secured by TLS:

- . Following establishment of the session's TCP connection, the sender and receiver SHALL undertake a TLS handshake in accordance with [RFC8446] with the sender acting in the role of "client". The parameter settings governing each such handshake (again, determined by management) are an implementation matter, but the handshake SHOULD conform to all recommended best practices of [RFC7525] and its updates and successors.
- . If the handshake does not result in successful establishment of a TLS session, then the session's TCP connection SHALL be terminated and the attempt to form an MTCP session SHALL be abandoned.

MTCP sessions are unidirectional; that is, bundles transmitted via an MTCP session are transmitted only from the session's sender to its receiver. When bidirectional exchange of bundles between MCLAs via MTCP is required, two MTCP sessions are formed, one in each direction.

Closure of either element of a session MAY occur either upon request of the bundle protocol agent or upon detection of any error. Closure of either element of an MTCP session SHALL cause the corresponding TCP connection to be terminated (unless termination of that connection was in fact the cause of the closure of that session element). Since termination of the associated TCP connection will result in errors at the other element of the session, termination of either element of the session will effectively terminate the session.

3.2. MTCP Protocol Data Units

An MTCP protocol data unit (MPDU) is simply a serialized bundle in a CBOR representation that indicates the length of that serialized bundle. An MPDU is constructed as follows.

Each MPDU SHALL be a single serialized BP bundle, termed the "encapsulated bundle", represented as a CBOR byte string of definite length (NOT an indefinite-length byte string).

4. MTCP Procedures

4.1. MPDU Transmission

When an MCLA is requested by the bundle protocol agent to send a bundle to a peer MCLA identified by some IP address and port number:

- . If no MTCP session enabling transmission to that MCLA has been formed, the MCLA SHALL attempt to form that session. If this

- attempt is unsuccessful, the MCLA SHALL inform the bundle protocol agent that its data sending procedures with regard to this bundle have concluded and transmission of the bundle was unsuccessful; no further steps of this procedure will be attempted.
- . The MCLA SHALL form an MPDU from the subject bundle.
 - . The MCLA SHALL attempt to send this MPDU to the peer MCLA by TCP via the transmission element of the session formed for this purpose.
 - o If that transmission is completed without error, the MCLA SHALL inform the bundle protocol agent that its data sending procedures with regard to this bundle have concluded and transmission of the bundle was successful.
 - o Otherwise:
 - . The transmission element SHALL be closed.
 - . The MCLA SHALL inform the bundle protocol agent that its data sending procedures with regard to this bundle have concluded and transmission of the bundle was unsuccessful.

4.2. Reception Session Formation

An MCLA that is required to receive (rather than only transmit) bundles SHALL issue a passive TCP OPEN. Whenever TCP matches that passive OPEN with an active TCP OPEN issued by some MCLA, an MTCP session is formed as noted earlier; MPDUs may be received via the reception element of such session.

4.3. MPDU Reception

From the moment at which an MTCP session reception element is first exposed to the moment at which it is closed, in a continuous cycle, the corresponding session's receiver SHALL:

- . Attempt to receive, by TCP via the corresponding session, a serialized BP bundle represented as a CBOR byte string of definite length. If this attempt fails for any reason, the reception element SHALL be closed and no further steps of this procedure will be attempted.
- . Deliver the received serialized bundle to the bundle protocol agent.

5. Security Considerations

Because MTCP constitutes a nearly negligible extension of TCP, it introduces virtually no security considerations beyond the well-

known TCP security considerations. To address these considerations, the use of TLS to secure MTCP sessions is strongly recommended.

Even when TLS is used to secure an MTCP session, the ciphersuite specified for the TLS session may be insecure. For example, TLS can be configured to support authentication without confidentiality. MCLA management MUST ensure that the ciphersuites employed to secure MTCP sessions meet transport security requirements. This constraint echoes constraints on STARTTLS in [[RFC2595](#)].

An adversary could mount a denial-of-service attack by repeatedly establishing and terminating MTCP sessions; well-understood DOS attack mitigations would apply.

Maliciously formed bundle lengths could disrupt the operation of MTCP session receivers, but MTCP implementations need to be robust against incorrect bundle lengths in any case.

Maliciously crafted serialized bundles could be received and delivered to the bundle protocol agent, but that is not an MTCP-specific security consideration: all bundles delivered to the BPA by all convergence-layer adapters need to be processed in awareness of this possibility.

[6. IANA Considerations](#)

No new IANA considerations apply.

[7. References](#)

[7.1. Normative References](#)

[RFC7525] Sheffer, Y., Holz, R., and P. Saint-Andre, "Recommendations for Secure Use of Transport Layer Security (TLS) and Datagram Transport Layer Security (DTLS)", [BCP 195](#), [RFC 7525](#), May 2015.

[RFC0793] Postel, J., "Transmission Control Protocol", STD 7, [RFC 793](#), DOI 10.17487/RFC0793, September 1981.

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", [BCP 14](#), [RFC 2119](#), March 1997.

[RFC8446] Rescorla, E., "The Transport Layer Security (TLS) Protocol Version 1.3", [RFC 8446](#), August 2018.

7.2. Informative References

[RFC2595] Newman, C., "Using TLS with IMAP, POP3 and ACAP", [RFC 2595](#), August 2018.

[RFC5050] Scott, K. and S. Burleigh, "Bundle Protocol Specification", [RFC 5050](#), November 2007.

8. Acknowledgments

This document was prepared using 2-Word-v2.0.template.dot.

Appendix A.**For More Information**

Please refer comments to dtn@ietf.org. The Delay Tolerant Networking Research Group (DTNRG) Web site is located at <http://www.dtnrg.org>.

Copyright (c) 2019 IETF Trust and the persons identified as authors of the code. All rights reserved.

Redistribution and use in source and binary forms, with or without modification, is permitted pursuant to, and subject to the license terms contained in, the Simplified BSD License set forth in [Section 4.c](#) of the IETF Trust's Legal Provisions Relating to IETF Documents (<http://trustee.ietf.org/license-info>).

Authors' Address

Scott Burleigh
Jet Propulsion Laboratory, California Institute of Technology
4800 Oak Grove Dr.
Pasadena, CA 91109-8099
US
Phone: +1 818 393 3353
Email: Scott.Burleigh@jpl.nasa.gov