

TCP Maintenance and Minor Extensions (tcpm)  
Internet-Draft  
Intended status: Standards Track  
Expires: January 1, 2016

A. Zimmermann  
R. Scheffenegger  
NetApp, Inc.  
B. Briscoe

June 30, 2015

**The TCP Echo and TCP Echo Reply Options**  
**draft-zimmermann-tcpm-echo-option-00**

Abstract

This document specifies the TCP Echo and TCP Echo Reply options. It provides a single field a TCP sender can use to store any type of data that a TCP receiver simply echo unmodified back. In contrast to the original TCP Echo and TCP Echo Reply options defined in [RFC 1072](#) the options specified in this document have slightly different semantics and support a variable option length.

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 <http://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 January 1, 2016.

Copyright Notice

Copyright (c) 2015 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.

1. Introduction

This document specifies the TCP Echo and TCP Echo Reply options. It provides a single field a TCP sender can use to store any type of data that a TCP receiver simply echo unmodified back. In contrast to the original TCP Echo and TCP Echo Reply options defined in RFC 1072 [RFC1072] the options specified in this document have a slightly different semantics and support a variable option length.

2. Terminology

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 [RFC2119]. These words only have such normative significance when in ALL CAPS, not when in lower case.

3. The TCP Echo and TCP Echo Reply options

The general structure of TCP options is defined in [RFC0793]. The TCP Echo option is organized as indicated in Figure 1.

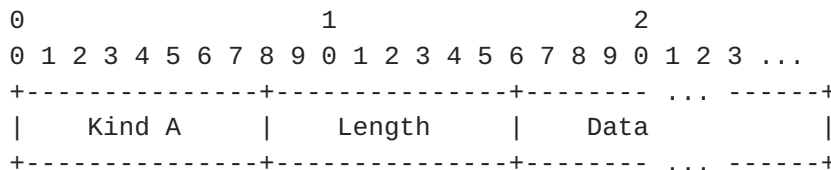


Figure 1: The TCP Echo option

The codepoint value of the TCP Echo 'Kind A' is {ToDo: Value TBA}. The value of the 'Length' field in octets can be any value greater than 1 as long as the TCP Echo option completely fits into TCP option space, which may be extended (see [RFC0793], [I-D.ietf-tcpm-tcp-edo], [I-D.briscoe-tcpm-inner-space]). The optional 'Data' field is available for the TCP sender to fill with any amount of any type of data it wishes to be send back by the TCP receiver in a subsequent TCP Echo Reply option (see Figure 2). It is only be constrained in size to an integer number of octets.

The TCP Echo facility is determined in both directions using a single exchange during the 3-way handshake [RFC0793]. A TCP seeking to use TCP Echo facility includes the TCP Echo option in the initial SYN or SYN/ACK. If the TCP receiver of that SYN or SYN/ACK agrees to



support TCP Echo facility, it MUST respond with TCP Echo Reply option (see Figure 2) in its corresponding segment.

Both TCP endpoints MAY use the TCP Echo facility in any segment, but only if the TCP Echo option was received in a segment with the SYN bit set (i.e., SYN and SYN/ACK) or the TCP Echo Reply option was received in response to a sent TCP Echo option. In all cases an endpoint MUST NOT include more than one TCP Echo option per segment.

A TCP sender MAY send an empty TCP Echo option with Length=2 on the SYN, to only indicate that it supports the TCP Echo facility. In that case, the TCP receiver of that SYN MUST response with an empty TCP Echo Reply option with Length=2 accordingly.

The TCP Echo Reply option is organized as indicated in Figure 2.

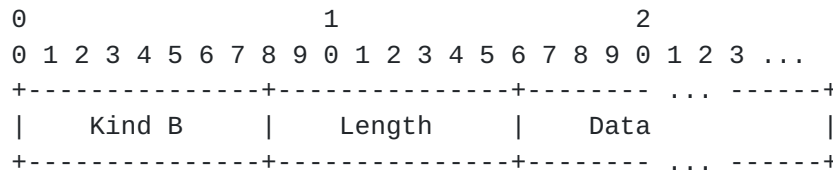


Figure 2: The TCP Echo Reply Option

A TCP receiver that does not implement the TCP Echo facility or decides to not use the TCP Echo facility for this particular connection MUST silently ignore any TCP Echo options it receives for this connection. If the TCP receiver has reflected the TCP Echo option in its SYN/ACK during the 3-way handshake, it MUST reply to any TCP Echo option received during this connection.

Once enabled on a connection, a TCP receiver that receives a TCP Echo option MUST return the same bytes of the Data field in a TCP Echo Reply option. This TCP Echo Reply option MUST returned in the next segment (e.g., an ACK segment) that is sent. If due to the delayed ACK algorithm [[RFC1122](#)] more than one TCP Echo option is received before a reply segment is sent, the TCP receiver MUST choose only one of the options to echo, ignoring the others; specifically, it MUST choose the most recently received TCP Echo option to echo back (i.e. Last In, First Out - LIFO).

**4. IANA Considerations**

This specification requires IANA to allocate a value from the TCP option kind name-space against the name

- 'Kind A'
- 'Kind B'



Early implementation before the IANA allocation MUST follow [[RFC6994](#)] and use experimental option 254 and respective Experiment ID:

0xEC01 (16 bits) for the TCP Echo option;  
0xEC02 (16 bits) for the TCP Echo Reply option;

The Echo option defined in [RFC1072](#) [[RFC1072](#)] specifies different semantics, which do not lend themselves for reuse. Specifically, [RFC1072](#) [[RFC1072](#)] specifies to select the TCP Echo option data from the newest segment with the oldest sequence number, while herein we specify to return the TCP Echo option of the most recently received segment, regardless of sequence numbers.

{ToDo: Values TBA and register them with IANA} then migrate to the assigned option after allocation.}

## 5. Security Considerations

An implementation should not rely on this facility for critical TCP mechanisms, before ensuring that the TCP Echo option data field is reflected back properly and unmodified. If the TCP Echo option is considered critical, a TCP mechanism should have means to verify the integrity of the data contained in the TCP Echo Reply option. Additionally, a malicious receiver or network device may infer the utility of the data in a TCP Echo option, and interpret it for its purposes. A designer using the TCP Echo facility needs to consider this, and take appropriate measures to prevent misuse of the data sent.

Since TCP options are not delivered reliably, a TCP Echo or TCP Echo Reply option may be lost or reordered at any time, a TCP mechanisms MUST to deal appropriately with this occurrences.

If multiple TCP mechanisms want to make use of the TCP Echo facility, the implementer should accommodate for that, for example by encoding the multiple inputs accordingly into the data field of the TCP Echo option.

Some middleboxes have been known to remove TCP options unknown to them like those described in this document (see [[Honda11](#)]). As the TCP Echo and TCP Echo Reply option use two different option numbers, it is conceivable that only one or the other may get stripped from a segment, in one direction, resulting in an unidirectional usability of the TCP Echo facility.



## **6. Privacy Considerations**

This document describes a new mechanism to tag individual TCP segments. However, the TCP options described do not expose individual user's data. In order to better maintain the confidentiality of data exchanged on the wire, and to address some aspects of security, it is NOT RECOMMENDED to send easily decipherable data in the clear as data in the TCP Echo option.

## **7. Acknowledgements**

Alexander Zimmermann have received funding from the European Union's Horizon 2020 research and innovation program 2014-2018 under grant agreement No. 644866 (SSICLOPS). This document reflects only the authors' views and the European Commission is not responsible for any use that may be made of the information it contains.

## **8. References**

### **8.1. Normative References**

- [RFC0793] Postel, J., "Transmission Control Protocol", STD 7, [RFC 793](#), September 1981.
- [RFC1122] Braden, R., "Requirements for Internet Hosts - Communication Layers", STD 3, [RFC 1122](#), October 1989.
- [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", [BCP 14](#), [RFC 2119](#), March 1997.
- [RFC6994] Touch, J., "Shared Use of Experimental TCP Options", [RFC 6994](#), August 2013.

### **8.2. Informative References**

- [Honda11] Honda, M., Nishida, Y., Raiciu, C., Greenhalgh, A., Handley, M., and H. Tokuda, "Is it still possible to extend TCP?", Proc. of ACM Internet Measurement Conference (IMC) '11, November 2011.
- [I-D.briscoe-tcpm-inner-space] Briscoe, B., "Inner Space for TCP Options", [draft-briscoe-tcpm-inner-space-01](#) (work in progress), October 2014.
- [I-D.ietf-tcpm-tcp-edo] Touch, J. and W. Eddy, "TCP Extended Data Offset Option", [draft-ietf-tcpm-tcp-edo-01](#) (work in progress), October 2014.





[RFC1072] Jacobson, V. and R. Braden, "TCP extensions for long-delay paths", [RFC 1072](#), October 1988.

#### Authors' Addresses

Alexander Zimmermann  
NetApp, Inc.  
Sonnenallee 1  
Kirchheim 85551  
Germany

Phone: +49 89 900594712  
Email: [alexander.zimmermann@netapp.com](mailto:alexander.zimmermann@netapp.com)

Richard Scheffenegger  
NetApp, Inc.  
Am Euro Platz 2  
Vienna 1120  
Austria

Email: [rs@netapp.com](mailto:rs@netapp.com)

Bob Briscoe

Email: [ietf@bobbriscoe.net](mailto:ietf@bobbriscoe.net)  
URI: <http://bobbriscoe.net/>

