

Network Working Group
Internet-Draft
Intended status: Standards Track
Expires: November 26, 2018

M. Jethanandani

A. Mishra
SES Networks
A. Saxena
Ciena Corporation
M. Bhatia
Nokia
May 25, 2018

Optimizing BFD Authentication
draft-ietf-bfd-optimizing-authentication-05

Abstract

This document describes an optimization to BFD Authentication as described in [Section 6.7](#) of BFD [RFC5880](#).

Requirements Language

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 [BCP 14](#) [[RFC2119](#)] [[RFC8174](#)] when, and only when, they appear in all capitals, as shown here.

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 November 26, 2018.

Copyright Notice

Copyright (c) 2018 IETF Trust and the persons identified as the document authors. All rights reserved.

This document is subject to [BCP 78](https://trustee.ietf.org/license-info) 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 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.

Table of Contents

1.	Introduction	2
2.	Authentication Mode	3
3.	NULL Auth TLV	4
4.	IANA Considerations	5
5.	Security Considerations	6
6.	References	6
6.1.	Normative References	6
6.2.	Informative References	6
	Authors' Addresses	7

[1.](#) Introduction

Authenticating every BFD [[RFC5880](#)] packet with a Simple Password, or with a MD5 Message-Digest Algorithm [[RFC1321](#)] , or Secure Hash Algorithm (SHA-1) algorithms is computationally intensive process, making it difficult if not impossible to authenticate every packet - particularly at faster rates. Also, the recent escalating series of attacks on MD5 and SHA-1 [[SHA-1-attack1](#)] [[SHA-1-attack2](#)] raise concerns about their remaining useful lifetime as outlined in Updated Security Considerations for the MD5 Message-Digest and the HMAC-MD5 Algorithm [[RFC6151](#)] and Security Considerations for the SHA-0 and SHA-1 Message-Digest Algorithm [[RFC6194](#)]. If replaced by stronger algorithms, the computational overhead, will make the task of authenticating every packet even more difficult to achieve.

This document proposes that only BFD frames that signal a state change in BFD be authenticated. Rest of the frames can be transmitted and received without authentication enabled. Most frames that are transmitted and received have no state change associated with them. Limiting authentication to frames that affect a BFD session state allows more sessions to be supported for

authentication. Moreover, most BFD frames that signal a state change are generally transmitted at a slower interval of 1s leaving enough time to compute the hash.

[Section 2](#) talks about the changes to authentication mode as described in BFD [[RFC5880](#)].

2. Authentication Mode

The cryptographic authentication mechanisms specified in BFD [[RFC5880](#)] describes enabling and disabling of authentication as a one time operation. As a security precaution, it mentions that authentication state be allowed to change at most once. Once enabled, every packet must have Authentication Bit set and the associated Authentication TLV appended. In addition, it states that an implementation SHOULD NOT allow the authentication state to be changed based on the receipt of a BFD Control packet.

This document proposes that the authentication mode be modified to be enabled on demand. Instead of authenticating every packet, BFD peers decide which frames need to be authenticated, and authenticate only those frames. For example, the two ends can decide that BFD frames that indicate a state change should be authenticated and enable authentication on those frames only. If the two ends have not previously negotiated which frames they will transmit or receive with authentication enabled, then the BFD session will fail to come up, because at least one end will expect every frame to be authenticated. The state changes for which authentication is being suggested include:

Read : On state change from <column> to <row>
 Auth : Authenticate frame
 NULL : No Authentication. Use NULL AUTH TLV.
 n/a : Invalid state transition.
 Select : Most frames NULL AUTH. Selective (periodic)
 frames authenticated.

	DOWN	INIT	UP	POLL	DEMAND
DOWN	NULL	Auth	Auth	Auth	Auth
INIT	Auth	NULL	Auth	Auth	Auth
UP	Auth	n/a	Select	Auth	Auth
POLL	Auth	n/a	Auth	Auth	Auth
DEMAND	Auth	Auth	Auth	Auth	Auth

Optimized Authentication Map

All frames already carry the sequence number. The NULL AUTH frames MUST contain the TLV specified in [Section 3](#). This enables a monotonically increasing sequence number to be carried in each frame, and prevents man-in-the-middle from capturing and replaying the same frame again. Since all frames still carry a sequence number, the logic for sequence number maintenance remains unchanged from [\[RFC5880\]](#). If at a later time, a different scheme is adopted for changing sequence number, this method can use the updated scheme without any impact.

Most frames transmitted on a BFD session are BFD CC UP frames. Authenticating a small subset of these frames (one per configured period) significantly reduces the computational demand for the system while maintaining security of the session across the configured authentication periods. The configuration of the periodic authentication interval for BFD CC UP frames is an open issue.

[3.](#) NULL Auth TLV

This section describes a new Authentication TLV as:

Note to RFC Editor: this section may be removed on publication as an REC.

5. Security Considerations

The approach described in this document enhances the ability to authentication a BFD session by taking away the onerous requirement that every frame be authenticated. By authenticating frames that affect the state of the session, the security of the BFD session is maintained. As such this document does not change the security considerations for BFD.

6. References

6.1. Normative References

- [I-D.ietf-bfd-secure-sequence-numbers]
Jethanandani, M., Agarwal, S., Mishra, A., Saxena, A., and A. DeKok, "Secure BFD Sequence Numbers", [draft-ietf-bfd-secure-sequence-numbers-01](#) (work in progress), November 2017.
- [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>>.

6.2. Informative References

- [RFC1321] Rivest, R., "The MD5 Message-Digest Algorithm", [RFC 1321](#), DOI 10.17487/RFC1321, April 1992, <<https://www.rfc-editor.org/info/rfc1321>>.
- [RFC5880] Katz, D. and D. Ward, "Bidirectional Forwarding Detection (BFD)", [RFC 5880](#), DOI 10.17487/RFC5880, June 2010, <<https://www.rfc-editor.org/info/rfc5880>>.
- [RFC6151] Turner, S. and L. Chen, "Updated Security Considerations for the MD5 Message-Digest and the HMAC-MD5 Algorithms", [RFC 6151](#), DOI 10.17487/RFC6151, March 2011, <<https://www.rfc-editor.org/info/rfc6151>>.
- [RFC6194] Polk, T., Chen, L., Turner, S., and P. Hoffman, "Security Considerations for the SHA-0 and SHA-1 Message-Digest Algorithms", [RFC 6194](#), DOI 10.17487/RFC6194, March 2011, <<https://www.rfc-editor.org/info/rfc6194>>.

[SHA-1-attack1]

Wang, X., Yin, Y., and H. Yu, "Finding Collisions in the Full SHA-1", 2005.

[SHA-1-attack2]

Wang, X., Yao, A., and F. Yao, "New Collision Search for SHA-1", 2005.

Authors' Addresses

Mahesh Jethanandani
USA

Email: mjethanandani@gmail.com

Ashesh Mishra
SES Networks

Email: mishra.ashesh@gmail.com

Ankur Saxena
Ciena Corporation
3939 N 1st Street
San Jose, CA 95134
USA

Email: ankurpsaxena@gmail.com

Manav Bhatia
Nokia
Bangalore
India

Email: manav.bhatia@nokia.com

