Network Working Group
Internet-Draft
Intended status: Standards Track
Expires: June 8, 2016

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December 6, 2015

Optimizing BFD Authentication
draft-ietf-bfd-optimizing-authentication-00

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 RFC 2119 [RFC2119].

Status of This Memo

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

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This Internet-Draft will expire on June 8, 2016.

Table of Contents

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:

Poll Sequence

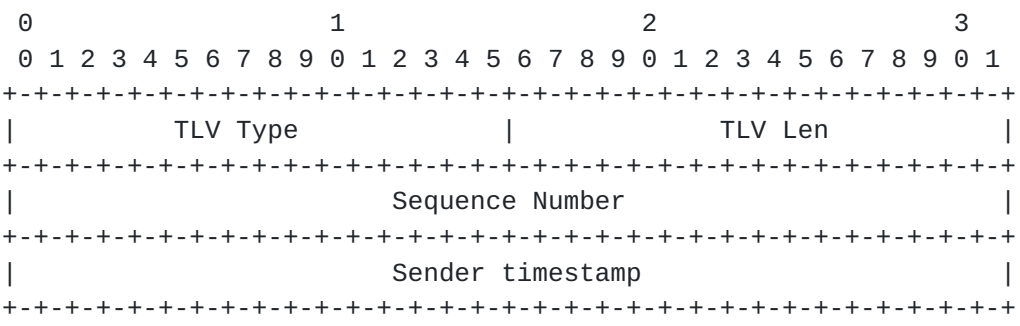
Demand Mode

BFD packet with the Diag flag set

Authenticated frames already carry the sequence number. The rest of the 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.

3. NULL Auth TLV

This section describes a new Authentication TLV as:



NULL Auth TLV

where:

TLV Type: The TLV Type. This field MUST be set to <IANA assigned>.

TLV Length: The length of the NULL Auth TLV, in bytes i.e. 8 bytes

Sequence Number: is a monotonically increasing number while the session state is UP. Once the session goes down the Sequence number SHOULD be set to 0.

Sender timestamp: is not used by authentication, and is documented to be compatible with BFD Stability [I-D.ashesh-bfd-stability]. It should be set to 0, and should be ignored by the receiver.

4. IANA Considerations

IANA is requested to assign a new Auth Type for the NULL Auth TLV.

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

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

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