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Optimizing BFD Authentication
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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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1. Introduction

Authenticating every BFD [RFC5880] packet with a Simple Password, or with a MD5 Message-Digest Algorithm [RFC1321] and Secure Hash Algorithm (SHA-1) algorithms is computationally intensive process, making it difficult if not impossible to authenticate every packet - particularly at faster intervals. In addition, 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 requirement of a stronger algorithms 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. The rest of the frames can be transmitted and received without authentication enabled. Bulk of the frames that are transmitted and received have no state change associated with them. Limiting authentication to frames that affect a BFD session state allows for 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 turned on, the document talks about every packet being enabled with Authentication bit and payload. 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 every packet being authenticated, the two ends can 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.

3. IANA Considerations

This document makes no request of IANA.

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

4. 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.

5. References

5.1. Normative References

[FIPS-180-2]
National Institute of Standards and Technology, FIPS PUB 180-2, "The Keyed-Hash Message Authentication Code (HMAC)", August 2002.

[FIPS-198]
National Institute of Standards and Technology, FIPS PUB 198, "The Keyed-Hash Message Authentication Code (HMAC)", March 2002.

[I-D.ietf-bfd-generic-crypto-auth]
Bhatia, M., Manral, V., Zhang, D., and M. Jethanandani, "BFD Generic Cryptographic Authentication", draft-ietf-bfd-generic-crypto-auth-06 (work in progress), April 2014.

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

[RFC6039] Manral, V., Bhatia, M., Jaeggli, J., and R. White, "Issues with Existing Cryptographic Protection Methods for Routing Protocols", RFC 6039, October 2010.

[RFC6151] Turner, S. and L. Chen, "Updated Security Considerations for the MD5 Message-Digest and the HMAC-MD5 Algorithms", RFC 6151, March 2011.

[RFC6194] Polk, T., Chen, L., Turner, S., and P. Hoffman, "Security Considerations for the SHA-0 and SHA-1 Message-Digest Algorithms", RFC 6194, March 2011.

5.2. Informative References

[Dobb96a] Dobbertin, H., "Cryptanalysis of MD5 Compress", May 1996.

[Dobb96b] Dobbertin, H., "The Status of MD5 After a Recent Attack", CryptoBytes", 1996.

[I-D.ietf-karp-design-guide]
Lebovitz, G. and M. Bhatia, "Keying and Authentication for Routing Protocols (KARP) Design Guidelines", draft-ietf-karp-design-guide-10 (work in progress), December 2011.

[MD5-attack]
Wang, X., Feng, D., Lai, X., and H. Yu, "Collisions for Hash Functions MD4, MD5, HAVAL-128 and RIPEMD", August 2004.

[NIST-HMAC-SHA]
National Institute of Standards and Technology, Available online at http://csrc.nist.gov/groups/ST/hash/policy.html, "NIST’s Policy on Hash Functions", 2006.

[RFC1321] Rivest, R., "The MD5 Message-Digest Algorithm", RFC 1321, April 1992.

[RFC2104] Krawczyk, H., Bellare, M., and R. Canetti, "HMAC: Keyed-Hashing for Message Authentication", RFC 2104, February 1997.

[RFC4086] Eastlake, D., Schiller, J., and S. Crocker, "Randomness Requirements for Security", BCP 106, RFC 4086, June 2005.

[RFC4822] Atkinson, R. and M. Fanto, "RIPv2 Cryptographic Authentication", RFC 4822, February 2007.

[RFC5310] Bhatia, M., Manral, V., Li, T., Atkinson, R., White, R., and M. Fanto, "IS-IS Generic Cryptographic Authentication", RFC 5310, February 2009.

[RFC5709] Bhatia, M., Manral, V., Fanto, M., White, R., Barnes, M., Li, T., and R. Atkinson, "OSPFv2 HMAC-SHA Cryptographic Authentication", RFC 5709, October 2009.

[RFC5880] Katz, D. and D. Ward, "Bidirectional Forwarding Detection (BFD)", RFC 5880, June 2010.

[RFC6234] Eastlake, D. and T. Hansen, "US Secure Hash Algorithms (SHA and SHA-based HMAC and HKDF)", RFC 6234, May 2011.

[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.

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