

Extended Sequence Number Addendum to IPsec DOI for ISAKMP

[draft-ietf-ipsec-esn-addendum-02.txt](#)

Status of This Memo

This document is an Internet Draft and is subject to all provisions of [Section 10 of RFC2026](#). 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 6 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 a "work in progress".

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

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

Copyright (C) The Internet Society (2003). All Rights Reserved.

Abstract

The IP Security Authentication Header (AH) and Encapsulating Security Payload (ESP) protocols use a sequence number to detect replay. This document describes extensions to the Internet IP Security Domain of Interpretation (DOI) for the Internet Security Association and Key Management Protocol (ISAKMP). These extensions support negotiation of the use of traditional 32-bit sequence numbers or extended 64-bit sequence numbers for a particular AH or ESP security association.

Comments should be sent to Stephen Kent (kent@bbn.com).

1. Introduction

The specifications for the IP Authentication Header [[AH](#)] and the IP Encapsulating Security Payload (ESP) describe an option for use of Extended (64-bit) Sequence Numbers. This option permits transmission of very large volumes of data at high-speeds over an IPsec Security Association, without rekeying to avoid sequence number space exhaustion. This document describes the additions to the IPsec DOI for ISAKMP [[DOI](#)] that are needed to support negotiation of the Extended Sequence Number option.

The keywords MUST, MUST NOT, REQUIRED, SHALL, SHALL NOT, SHOULD, SHOULD NOT, RECOMMENDED, MAY, and OPTIONAL, when they appear in this document, are to be interpreted as described in [RFC 2119](#) [Bra97].

2. IPSEC Security Association Attribute

The following SA attribute definition is used in Phase II of an IKE negotiation. The attribute type is Basic (B). Encoding of this attribute is defined in the base ISAKMP specification [[ISAKMP](#)]. Attributes described as basic MUST NOT be encoded as variable. See [[IKE](#)] for further information on attribute encoding in the IPSEC DOI. All restrictions listed in [[IKE](#)] also apply to the IPSEC DOI and to this addendum.

Attribute Type

class	value	type

Extended (64-bit) Sequence Number	TBD	B

Class Values

This class specifies that the Security Association will be using 64-bit Sequence Numbers. (See [[AH](#)] and [[ESP](#)] for a description of Extended (64-bit) Sequence Numbers.)

RESERVED	0
64-bit Sequence Number	1

3. Attribute Negotiation

If an implementation receives a defined IPSEC DOI attribute (or attribute value) which it does not support, an ATTRIBUTES-NOT-SUPPORT SHOULD be sent and the security association setup MUST be aborted.

If an implementation receives any attribute value but the value for 64-bit Sequence Numbers, the security association setup MUST be aborted.

4. Security Considerations

This memo pertains to the Internet Key Exchange protocol ([\[IKE\]](#)), which combines ISAKMP ([\[ISAKMP\]](#)) and Oakley ([\[OAKLEY\]](#)) to provide for the derivation of cryptographic keying material in a secure and authenticated manner. Specific discussion of the various security protocols and transforms identified in this document can be found in the associated base documents and in the cipher references.

The addition of the ESN attribute does not change the underlying security characteristics of IKE. In using extended sequence numbers with ESP, it is important to employ an encryption mode that is secure when very large volumes of data are encrypted under a single key. Thus, for example, DES in CBC mode would NOT be suitable for use with the ESN, because no more than 2^{32} blocks should be encrypted under a single DES key in that mode. Similarly, the integrity algorithm used with ESP or AH should be secure relative to the number of packets being protected. To avoid potential security problems imposed by algorithm limitations, the SA lifetime may be set to limit the volume of data protected with a single key, prior to reaching the 2^{64} packet limit imposed by the ESN.

5. IANA Considerations

This document contains a "magic" number to be maintained by the IANA. No additional class values will be assigned for this attribute. Upon approval of this draft for publication as an RFC, IANA is to allocate an IPsec Security Attribute value for "Attribute Type". This value is to replace the TBD under the heading "value" in the table in [Section 2](#).

Acknowledgments

The author would like to thank the members of the IPsec working group. The author would also like to acknowledge the contributions of

Karen Seo for her help in the editing of this specification.

References

- [AH] Kent, S., "IP Authentication Header", RFC ???, ??? 2003.
- [DOI] Piper, D., "The Internet IP Security Domain of Interpretation for ISAKMP", [RFC 2407](#), November 1998.
- [ESP] Kent, S., "IP Encapsulating Security Payload (ESP)", RFC ???, ??? 2003.
- [IKE] Harkins, D., and D. Carrel, D., "The Internet Key Exchange (IKE)", [RFC 2409](#), November 1998.
- [ISAKMP] Maughan, D., Schertler, M., Schneider, M., and J. Turner, "Internet Security Association and Key Management Protocol (ISAKMP)", [RFC 2408](#), November 1998.
- [OAKLEY] Orman, H., "The OAKLEY Key Determination Protocol", [RFC 2412](#), November 1998.

Disclaimer

The views and specification here are those of the authors and are not necessarily those of their employers. The authors and their employers specifically disclaim responsibility for any problems arising from correct or incorrect implementation or use of this specification.

Author Information

Stephen Kent
BBN Technologies
10 Moulton Street
Cambridge, MA 02138
USA

Phone: +1 (617) 873-3988
EMail: kent@bbn.com

Copyright (C) The Internet Society (2003). All Rights Reserved.

This document and translations of it may be copied and furnished to others, and derivative works that comment on or otherwise explain it or assist in its implementation may be prepared, copied, published and distributed, in whole or in part, without restriction of any kind, provided that the above copyright notice and this paragraph are included on all such copies and derivative works. However, this document itself may not be modified in any way, such as by removing the copyright notice or references to the Internet Society or other Internet organizations, except as needed for the purpose of developing Internet standards in which case the procedures for copyrights defined in the Internet Standards process must be followed, or as required to translate it into languages other than English.

The limited permissions granted above are perpetual and will not be revoked by the Internet Society or its successors or assigns.

This document and the information contained herein is provided on an "AS IS" basis and THE INTERNET SOCIETY AND THE INTERNET ENGINEERING TASK FORCE DISCLAIMS ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY WARRANTY THAT THE USE OF THE INFORMATION HEREIN WILL NOT INFRINGE ANY RIGHTS OR ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

Expires January 2004

