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Using Edwards-curve Digital Signature Algorithm (EdDSA) in the Internet  
Key Exchange (IKEv2)  
[draft-nir-ipsecme-eddsa-01](#)

## Abstract

This document describes the use of the Edwards-curve digital signature algorithm in the IKEv2 protocol.

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[1.](#) Introduction

The Internet Key Exchange protocol [[RFC7296](#)] can use arbitrary signature algorithms as described in [[RFC7427](#)]. The latter RFC defines the SIGNATURE\_HASH\_ALGORITHMS notification where each side of the IKE negotiation lists its supported hash algorithms. This assumes that all signature schemes involve a hashing phase followed by a signature phase. This made sense because most signature algorithms either cannot sign messages bigger than their key or truncate messages bigger than their key.

EdDSA ([\[I.D-eddsa\]](#)) defines signature methods that do not require pre-hashing of the message. Unlike other methods, these accept arbitrary-sized messages, so no pre-hashing is required. These methods are called Ed25519 and Ed448, which respectively use the Edwards 25519 and the Edwards 448 ("Goldilocks") curves. Although that document also defines pre-hashed versions of these algorithm, those versions are not recommended for protocols where the entire to-be-signed message is available at once.

EdDSA defines the binary format of the signatures that should be used in the "Signature Value" field of the Authentication Data Format in [section 3](#). The "EdDSA, Ed25519, Ed448, Curve25519 and Curve448 for X.509" document ([\[I.D-curdle-pkix\]](#)) defines the object identifiers (OIDs) for these signature methods. For convenience, these OIDs are repeated in [Appendix A](#).

In order to signal within IKE that no hashing needs to be done, we define a new value has in the SIGNATURE\_HASH\_ALGORITHMS notification, one that indicates that no hashing is performed.

### [1.1.](#) Conventions Used in This Document

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](#)].

## [2.](#) The "Identity" Hash Identifier

This document defines a new value called "Identity" (value TBA by IANA) in the hash algorithm registry for use in the SIGNATURE\_HASH\_ALGORITHMS notification. Inserting this new value into the notification indicates that the receiver supports at least one signature algorithm that accepts arbitrary-sized messages such as Ed25519 and Ed448.

Ed25519 and Ed448 are only defined with the Identity hash, and MUST NOT be sent to a receiver that has not indicated support for the "Identity" hash.

The pre-hashed versions of Ed25519 and Ed448 (Ed25519ph and Ed448ph respectively) SHOULD NOT be used in IKE.

## [3.](#) Security Considerations

The new "Identity" value is needed only for signature algorithms that accept an arbitrary-sized input. It MUST NOT be used if none of the supported algorithms has this property. On the other hand there is no good reason to pre-hash the inputs where the signature algorithm either does not require it or performs a hash internally. For this reason implementations SHOULD have the "Identity" value in the SIGNATURE\_HASH\_ALGORITHMS notification when they support EdDSA. Implementations SHOULD NOT have other hash algorithms in the notification if all signature algorithms have this property.

## [4.](#) IANA Considerations

IANA is requested to assign a new value from the "IKEv2 Hash Algorithms" registry with name "Identity" and this document as reference.

## 5. Normative References

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", [BCP 14](#), [RFC 2119](#), DOI 10.17487/RFC2119, March 1997, <<http://www.rfc-editor.org/info/rfc2119>>.

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[RFC7296] Kaufman, C., Hoffman, P., Nir, Y., Eronen, P., and T. Kivinen, "Internet Key Exchange Protocol Version 2 (IKEv2)", STD 79, [RFC 7296](#), DOI 10.17487/RFC7296, October 2014, <<http://www.rfc-editor.org/info/rfc7296>>.

[RFC7427] Kivinen, T. and J. Snyder, "Signature Authentication in the Internet Key Exchange Version 2 (IKEv2)", [RFC 7427](#), DOI 10.17487/RFC7427, January 2015, <<http://www.rfc-editor.org/info/rfc7427>>.

[I.D-eddsa]

Josefsson, S. and I. Liusvaara, "Edwards-curve Digital Signature Algorithm (EdDSA)", March 2016, <<https://tools.ietf.org/id/draft-irtf-cfrg-eddsa-05.html>>.

[I.D-curdle-pkix]

Josefsson, S., "EdDSA, Ed25519, Ed448, Curve25519 and Curve448 for X.509", April 2016, <<https://tools.ietf.org/html/draft-ietf-curdle-pkix-00>>.

## [Appendix A](#). ASN.1 Objects

The normative reference for the ASN.1 objects for Ed25519 and Ed448 is in [[I.D-curdle-pkix](#)]. They are repeated below for convenience.

### [A.1](#). ASN.1 Object for Ed25519

id-Curve25519 OBJECT IDENTIFIER ::= { 1.3.101.110 }

Parameters are absent.

Binary encoding: TBA

### [A.2](#). ASN.1 Object for Ed448

id-Curve448 OBJECT IDENTIFIER ::= { 1.3.101.111 }

Parameters are absent.

Binary encoding: TBA

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