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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>>.



- [RFC7296] Kaufman, C., Hoffman, P., Nir, Y., Eronen, P., and T. Kivinen, "Internet Key Exchange Protocol Version 2 (IKEv2)", STD 79, [RFC 7296](https://www.rfc-editor.org/info/rfc7296), 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](https://www.rfc-editor.org/info/rfc7427), 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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