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Clarifications for Ed25519, Ed448, X25519, and X448 Algorithm
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Abstract

This document updates [RFC 8410](#) to clarify existing and specify missing semantics for key usage bits when used in certificates that support the Ed25519, Ed448, X25519, and X448 Elliptic Curve Cryptography algorithms.

About This Document

This note is to be removed before publishing as an RFC.

Status information for this document may be found at <https://datatracker.ietf.org/doc/draft-mtis-lamps-8410-ku-clarifications/>.

Source for this draft and an issue tracker can be found at <https://github.com/seanturner/draft-mtis-lamps-8410-ku-clarifications>.

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Internet-Draft curve25519, curve448 ECC Clarifications January 2022

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Table of Contents

1.	Introduction	2
2.	Terminology	3
3.	New Section 5 for RFC 8410	3
4.	Security Considerations	4
5.	IANA Considerations	4
6.	References	4
6.1.	Normative References	4
6.2.	Informative References	5
	Acknowledgments	5
	Authors' Addresses	5

[1.](#) Introduction

[RFC8410] specifies the syntax and semantics for the Subject Public Key Information field in certificates that support Ed25519, Ed448, X25519, and X448 Elliptic Curve Cryptography (ECC) algorithms. As part of these semantics, it defines what combinations are permissible for the values of the key usage extension [[RFC5280](#)]. [[RFC8410](#)] did not define what values are not permissible nor did it refer to keyEncipherment or dataEncipherment. [[ERRATA](#)] has also been submitted to clarify that keyCertSign is always set in certification authority certificates. To address these changes, this document replaces [Section 5 of \[RFC8410\]](#) with [Section 3](#).

Internet-Draft curve25519, curve448 ECC Clarifications January 2022

2. Terminology

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [BCP 14](#) [[RFC2119](#)] [[RFC8174](#)] when, and only when, they appear in all capitals, as shown here.

3. New [Section 5](#) for [RFC 8410](#)

The intended application for the key is indicated in the keyUsage certificate extension.

If the keyUsage extension is present in a certificate that indicates id-X25519 or id-X448 in SubjectPublicKeyInfo, then the following MUST be present:

keyAgreement;

one of the following MAY also be present:

encipherOnly; or
decipherOnly;

and the following MUST NOT be present:

digitalSignature;
nonRepudiation;
keyEncipherment;
dataEncipherment;
keyCertSign; and
cRLSign.

If the keyUsage extension is present in an end-entity certificate that indicates id-Ed25519 or id-Ed448 in SubjectPublicKeyInfo, then the keyUsage extension MUST contain one or both of the following:

nonRepudiation; and
digitalSignature;

the following MAY also be present:

cRLSign;

and the following MUST NOT be present:

keyEncipherment;
dataEncipherment;
keyAgreement;
keyCertSign;
encipherOnly; and
decipherOnly.

If the keyUsage extension is present in a certification authority certificate that indicates id-Ed25519 or id-Ed448 in SubjectPublicKeyInfo, then the keyUsage extension MUST contain keyCertSign, and zero, or more of the following:

nonRepudiation;
digitalSignature; and
cRLSign;

and the following MUST NOT be present:

keyEncipherment;
dataEncipherment;
keyAgreement;
encipherOnly; and
decipherOnly.

[4.](#) Security Considerations

This document introduces no new security considerations beyond those

found in [[RFC8410](#)].

5. IANA Considerations

This document has no IANA actions.

6. References

6.1. 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, <<https://www.rfc-editor.org/rfc/rfc2119>>.

[RFC5280] Cooper, D., Santesson, S., Farrell, S., Boeyen, S., Housley, R., and W. Polk, "Internet X.509 Public Key Infrastructure Certificate and Certificate Revocation List (CRL) Profile", [RFC 5280](#), DOI 10.17487/RFC5280, May 2008, <<https://www.rfc-editor.org/rfc/rfc5280>>.

[RFC8174] Leiba, B., "Ambiguity of Uppercase vs Lowercase in [RFC 2119](#) Key Words", [BCP 14](#), [RFC 8174](#), DOI 10.17487/RFC8174, May 2017, <<https://www.rfc-editor.org/rfc/rfc8174>>.

[RFC8410] Josefsson, S. and J. Schaad, "Algorithm Identifiers for Ed25519, Ed448, X25519, and X448 for Use in the Internet X.509 Public Key Infrastructure", [RFC 8410](#), DOI 10.17487/RFC8410, August 2018, <<https://www.rfc-editor.org/rfc/rfc8410>>.

6.2. Informative References

[ERRATA] Liao, L., "Errata 5696", 17 April 2019, <<https://www.rfc-editor.org/errata/eid5696>>.

TODO acknowledge.

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Expires 16 July 2022

[Page 5]

Internet-Draft curve25519, curve448 ECC Clarifications January 2022

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