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**Deprecation of IKEv1 and obsoleted algorithms  
draft-pwouters-ikev1-ipsec-graveyard-04**

Abstract

Internet Key Exchange version 1 (IKEv1) is deprecated. Accordingly, IKEv1 has been moved to Historic status. A number of old algorithms that are associated with IKEv1, and not widely implemented for IKEv2 are deprecated as well. IANA is instructed to close all IKEv1 registries.

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## [1.](#) Introduction

IKEv1 [[RFC2409](#)] and its related documents for ISAKMP [[RFC2408](#)] and IPsec DOI [[RFC2407](#)] were obsoleted by IKEv2 [[RFC4306](#)] in December 2005. The latest version of IKEv2 at the time of writing was published in 2014 in [[RFC7296](#)]. The Internet Key Exchange (IKE) version 2 has replaced version 1 over 15 years ago. IKEv2 has now seen wide deployment and provides a full replacement for all IKEv1 functionality. No new modifications or new algorithms have been accepted for IKEv1 for at least a decade. IKEv2 addresses various issues present in IKEv1, such as IKEv1 being vulnerable to amplification attacks. IKEv1 has been moved to Historic status, and this document requests IANA to close all IKEv1 registries.

Algorithm implementation requirements and usage guidelines for IKEv2 [[RFC8247](#)] and ESP/AH [[RFC8223](#)] gives guidance to implementors but limits that guidance to avoid broken or weak algorithms. It does not deprecate algorithms that have aged and are not in use, but leave these algorithms in a state of "MAY be used". This document deprecates those algorithms that are no longer advised but for which there are no known attacks resulting in their earlier deprecation.

## [2.](#) Requirements Language

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. [RFC 2409](#) to Historic**

IKEv1 is deprecated. Systems running IKEv1 should be upgraded and reconfigured to run IKEv2. Systems that support IKEv1 but not IKEv2 are most likely also unsuitable candidates for continued operation. Such unsupported systems have a much higher chance of containing an implementation vulnerability that will never be patched. IKEv1 systems can be abused for packet amplification attacks. IKEv1 systems most likely do not support modern algorithms such as AES-GCM or CHACHA20\_POLY1305 and quite often only support or have been configured to use the very weak Diffie-Hellman Groups 2 and 5. IKEv1 systems should be upgraded or replaced by IKEv2 systems.

IKEv1 and its way of using Preshared Keys (PSKs) protects against quantum computer based attacks. IKEv2 updated its use of PSK to improve the error reporting, but at the expense of post-quantum security. If post-quantum security is required, these systems should be migrated to use IKEv2 Postquantum Preshared Keys (PPK) [[draft-ietf-ipsecme-qr-ikev2](#)].

Some IKEv1 implementations support Labeled IPsec, a method to negotiate an additional Security Context selector to the SPD, but this method was never standardized in IKEv1. Those IKEv1 systems that require Labeled IPsec should migrate to an IKEv2 system supporting Labeled IPsec as specified in [[draft-ietf-ipsecme-labeled-ipsec](#)].

EDITOR NOTE: This document is expected to be released only after the PPK draft has become an RFC. While the same could be said for Labeled IPsec, there is no IKEv1 RFC that specifies Labeled IPsec, so pointing to a draft here does not demote a reference from RFC to a draft.

### **4. Deprecating obsolete algorithms**

This document deprecates the following algorithms:

- o Encryption Algorithms: RC5, IDEA, CAST, Blowfish, and the unspecified 3IDEA, ENCR\_DES\_IV64 and ENCR\_DES\_IV32
- o PRF Algorithms: the unspecified PRF\_HMAC\_TIGER
- o Integrity Algorithms: HMAC-MD5-128
- o Diffie-Hellman groups: none



## 5. Security Considerations

There are only security benefits by deprecating IKEv1 for IKEv2.

The deprecated algorithms have long been in disuse and are no longer actively deployed or researched. It presents an unknown security risk that is best avoided. Additionally, these algorithms not being supported in implementations simplifies those implementations and reduces the accidental use of these deprecated algorithms through misconfiguration or downgrade attacks.

## 6. IANA Considerations

This document instructs IANA to mark all IKEv1 registries as DEPRECATED.

Additionally, this document instructs IANA to add an additional Status column to the IKEv2 Transform Type registries and mark the following entries as DEPRECATED:

Transform Type 1 - Encryption Algorithm IDs

Number	Name	Status
-----	-----	-----
1	ENCR_DES_IV64	DEPRECATED [this document]
2	ENCR_DES	DEPRECATED [ <a href="#">RFC8247</a> ]
4	ENCR_RC5	DEPRECATED [this document]
5	ENCR_IDEA	DEPRECATED [this document]
6	ENCR_CAST	DEPRECATED [this document]
7	ENCR_BLOWFISH	DEPRECATED [this document]
8	ENCR_3IDEA	DEPRECATED [this document]
9	ENCR_DES_IV32	DEPRECATED [this document]

Figure 1

Transform Type 2 - Pseudorandom Function Transform IDs

Number	Name	Status
-----	-----	-----
1	PRF_HMAC_MD5	DEPRECATED [ <a href="#">RFC8247</a> ]
1	PRF_HMAC_TIGER	DEPRECATED [this document]

Figure 2



## Transform Type 3 - Integrity Algorithm Transform IDs

Number	Name	Status
-----	-----	-----
1	AUTH_HMAC_MD5_96	DEPRECATED [ <a href="#">RFC8247</a> ]
3	AUTH_DES_MAC	DEPRECATED [ <a href="#">RFC8247</a> ]
4	AUTH_KPDK_MD5	DEPRECATED [ <a href="#">RFC8247</a> ]
6	AUTH_HMAC_MD5_128	DEPRECATED [this document]
7	AUTH_HMAC_SHA1_160	DEPRECATED [this document]

Figure 3

## Transform Type 4 - Diffie Hellman Group Transform IDs

Number	Name	Status
-----	-----	-----
1	768-bit MODP Group	DEPRECATED [ <a href="#">RFC8247</a> ]
22	1024-bit MODP Group with 160-bit Prime Order Subgroup	DEPRECATED [ <a href="#">RFC8247</a> ]

Figure 4

All entries not mentioned here should receive no value in the new Status field.

This document instructs IANA to close and mark as obsolete the Internet Key Exchange (IKE) Attributes registries as well as the "Magic Numbers" for ISAKMP Protocol registries.

The IESG is requested to designate IKEv1 to Historic.

## 7. References

### 7.1. Normative References

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## **7.2. Informative References**

- [[draft-ietf-ipsecme-labeled-ipsec](#)]  
Wouters, P. and S. Prasad, "Labeled IPsec Traffic Selector support for IKEv2", [draft-ietf-ipsecme-labeled-ipsec](#) (work in progress), March 2019.
- [[draft-ietf-ipsecme-qr-ikev2](#)]  
Fluhrer, S., McGre, D., Kampanakis, P., and V. Smyslov, "Postquantum Preshared Keys for IKEv2", [draft-ietf-ipsecme-qr-ikev2](#) (work in progress), March 2019.



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