

Workgroup: Network Working Group  
Internet-Draft:  
draft-melnikov-scam-sha3-512-02  
Published: 19 October 2021  
Intended Status: Standards Track  
Expires: 22 April 2022  
Authors: A. Melnikov, Ed.

Isode Ltd

## **SCRAM-SHA3-512 and SCRAM-SHA3-512-PLUS Simple Authentication and Security Layer (SASL) Mechanisms**

### **Abstract**

This document registers the Simple Authentication and Security Layer (SASL) mechanisms SCRAM-SHA3-512 and SCRAM-SHA3-512-PLUS.

### **Status of This Memo**

This Internet-Draft is submitted in full conformance with the provisions of BCP 78 and BCP 79.

Internet-Drafts are working documents of the Internet Engineering Task Force (IETF). Note that other groups may also distribute working documents as Internet-Drafts. The list of current Internet-Drafts is at <https://datatracker.ietf.org/drafts/current/>.

Internet-Drafts are draft documents valid for a maximum of six 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 "work in progress."

This Internet-Draft will expire on 22 April 2022.

### **Copyright Notice**

Copyright (c) 2021 IETF Trust and the persons identified as the document authors. All rights reserved.

This document is subject to BCP 78 and the IETF Trust's Legal Provisions Relating to IETF Documents (<https://trustee.ietf.org/license-info>) in effect on the date of publication of this document. Please review these documents carefully, as they describe your rights and restrictions with respect to this document. Code Components extracted from this document must include Simplified BSD License text as described in Section 4.e of the Trust Legal Provisions and are provided without warranty as described in the Simplified BSD License.

## Table of Contents

- [1. Introduction](#)
- [2. Key Word Definitions](#)
- [3. SCRAM-SHA3-512 and SCRAM-SHA3-512-PLUS](#)
- [4. Security Considerations](#)
- [5. IANA Considerations](#)
- [6. References](#)
  - [6.1. Normative References](#)
  - [6.2. Informative References](#)
- [Acknowledgements](#)
- [Author's Address](#)

### 1. Introduction

This document registers the SASL [[RFC4422](#)] mechanisms SCRAM-SHA3-512 and SCRAM-SHA3-512-PLUS. SHA3-512 has stronger security properties than SHA-1, and it is expected that SCRAM mechanisms based on it will have greater predicted longevity than the SCRAM mechanisms based on SHA-1. SHA3-512 works differently from SHA-2 family of hash functions, so it is also expected that vulnerabilities in SHA-2 hash functions are not going to necessarily affect SHA-3 family of hash functions.

### 2. Key Word Definitions

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

### 3. SCRAM-SHA3-512 and SCRAM-SHA3-512-PLUS

The SCRAM-SHA3-512 and SCRAM-SHA3-512-PLUS SASL mechanisms are defined in the same way that SCRAM-SHA-1 and SCRAM-SHA-1-PLUS are defined in [[RFC5802](#)], except that the hash function for HMAC() and H() uses SHA3-512 [[NIST.FIPS.202](#)] instead of SHA-1.

For the SCRAM-SHA3-512 and SCRAM-SHA3-512-PLUS SASL mechanisms, the hash iteration-count announced by a server SHOULD be at least 10000.

The GSS-API mechanism OID for SCRAM-SHA3-512 is 1.3.6.1.5.5.<TBD> (see [Section 5](#)).

This is a simple example of a SCRAM-SHA3-512 authentication exchange when the client doesn't support channel bindings. The username 'user' and password 'pencil' are being used.

## 4. Security Considerations

The security considerations from [\[RFC5802\]](#) still apply.

To be secure, SCRAM-SHA3-512-PLUS MUST be used over a TLS channel that has had the session hash extension [\[RFC7627\]](#) negotiated, or session resumption MUST NOT have been used. When using SCRAM over TLS 1.2 [\[RFC5246\]](#), the "tls-unique" channel binding is still the default channel binding to use (see Section 6.1 of [\[RFC5802\]](#)), assuming the above conditions are satisfied. As "tls-unique" channel binding is not defined for TLS 1.3 [\[RFC8446\]](#), when using SCRAM over TLS 1.3, the "tls-exporter" channel binding [\[tls-1.3-channel-binding\]](#) MUST be the default channel binding (in the sense specified in Section 6.1 of [\[RFC5802\]](#)) to use.

See [\[RFC4270\]](#) and [\[RFC6194\]](#) for reasons to move from SHA-1 to a strong security mechanism like SHA3-512.

The strength of this mechanism is dependent in part on the hash iteration-count, as denoted by "i" in [\[RFC5802\]](#). As a rule of thumb, the hash iteration-count should be such that a modern machine will take 0.1 seconds to perform the complete algorithm; however, this is unlikely to be practical on mobile devices and other relatively low-performance systems. At the time this was written, the rule of thumb gives around 15,000 iterations required; however, a hash iteration-count of 10000 takes around 0.5 seconds on current mobile handsets. This computational cost can be avoided by caching the ClientKey (assuming the Salt and hash iteration-count is stable). Therefore, the recommendation of this specification is that the hash iteration-count SHOULD be at least 10000, but careful consideration ought to be given to using a significantly higher value, particularly where mobile use is less important.

## 5. IANA Considerations

IANA is requested to add the following new SASL SCRAM mechanisms to the "SASL SCRAM Family Mechanisms" registry:

**To:** iana@iana.org

**Subject:** Registration of a new SASL SCRAM Family mechanism  
SCRAM-SHA3-512

**SASL mechanism name (or prefix for the family):** SCRAM-SHA3-512

**Security considerations:** [Section 4](#) of RFC XXXX

**Published specification (optional, recommended):** RFC XXXX

**Minimum iteration-count:** 10000

**OID:**

1.3.6.1.5.5.<TBD>

**Person & email address to contact for further information:** IETF  
KITTEN WG <kitten@ietf.org>

**Intended usage:** COMMON

**Owner/Change controller:** IESG <iesg@ietf.org>

**Note:** iana@iana.org

**To:**

**Subject:** Registration of a new SASL SCRAM Family mechanism  
SCRAM-SHA3-512-PLUS

**SASL mechanism name (or prefix for the family):** SCRAM-SHA3-512-  
PLUS

**Security considerations:** [Section 4](#) of RFC XXXX

**Published specification (optional, recommended):** RFC XXXX

**Minimum iteration-count:** 10000

**OID:** 1.3.6.1.5.5.<TBD>

**Person & email address to contact for further information:** IETF  
KITTEN WG <kitten@ietf.org>

**Intended usage:** COMMON

**Owner/Change controller:** IESG <iesg@ietf.org>

**Note:** 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/info/rfc2119>>.
- [RFC4422] Melnikov, A., Ed. and K. Zeilenga, Ed., "Simple Authentication and Security Layer (SASL)", RFC 4422, DOI 10.17487/RFC4422, June 2006, <<https://www.rfc-editor.org/info/rfc4422>>.
- [RFC5246] Dierks, T. and E. Rescorla, "The Transport Layer Security (TLS) Protocol Version 1.2", RFC 5246, DOI 10.17487/

RFC5246, August 2008, <<https://www.rfc-editor.org/info/rfc5246>>.

[RFC5802] Newman, C., Menon-Sen, A., Melnikov, A., and N. Williams, "Salted Challenge Response Authentication Mechanism (SCRAM) SASL and GSS-API Mechanisms", RFC 5802, DOI 10.17487/RFC5802, July 2010, <<https://www.rfc-editor.org/info/rfc5802>>.

[RFC7627] Bhargavan, K., Ed., Delignat-Lavaud, A., Pironti, A., Langley, A., and M. Ray, "Transport Layer Security (TLS) Session Hash and Extended Master Secret Extension", RFC 7627, DOI 10.17487/RFC7627, September 2015, <<https://www.rfc-editor.org/info/rfc7627>>.

[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/info/rfc8174>>.

[RFC8446] Rescorla, E., "The Transport Layer Security (TLS) Protocol Version 1.3", RFC 8446, DOI 10.17487/RFC8446, August 2018, <<https://www.rfc-editor.org/info/rfc8446>>.

**[tls-1.3-channel-binding]**

Whited, S., "Channel Bindings for TLS 1.3", Work in Progress, Internet-Draft, draft-ietf-kitten-tls-channel-bindings-for-tls13-11, 18 October 2021, <<https://www.ietf.org/archive/id/draft-ietf-kitten-tls-channel-bindings-for-tls13-11.txt>>.

[NIST.FIPS.202] Dworkin, M., "SHA-3 Standard: Permutation-Based Hash and Extendable-Output Functions", FIPS PUB 202, DOI 10.6028/nist.fips.202, August 2015, <<https://nvlpubs.nist.gov/nistpubs/FIPS/NIST.FIPS.202.pdf>>.

## 6.2. Informative References

[RFC4270] Hoffman, P. and B. Schneier, "Attacks on Cryptographic Hashes in Internet Protocols", RFC 4270, DOI 10.17487/RFC4270, November 2005, <<https://www.rfc-editor.org/info/rfc4270>>.

[RFC5226] Narten, T. and H. Alvestrand, "Guidelines for Writing an IANA Considerations Section in RFCs", RFC 5226, DOI 10.17487/RFC5226, May 2008, <<https://www.rfc-editor.org/info/rfc5226>>.

[RFC6194] Polk, T., Chen, L., Turner, S., and P. Hoffman, "Security Considerations for the SHA-0 and SHA-1 Message-Digest

Algorithms", RFC 6194, DOI 10.17487/RFC6194, March 2011,  
<<https://www.rfc-editor.org/info/rfc6194>>.

### **Acknowledgements**

This document is based on RFC 7677 by Tony Hansen.

Thank you to Ludovic Bocquet for comments and corrections.

### **Author's Address**

Alexey Melnikov (editor)  
Isode Ltd  
14 Castle Mews  
Hampton  
TW12 2NP  
United Kingdom

Email: [alexey.melnikov@isode.com](mailto:alexey.melnikov@isode.com)