

Internet Engineering Task Force  
Internet-Draft  
Intended status: Standards Track  
Expires: October 20, 2017

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April 18, 2017

Increase minimum recommended modulus size to 2048 bits  
draft-lvelvindron-curdle-dh-group-exchange-00

## Abstract

The Diffie-Hellman (DH) Group Exchange for the Secure Shell (SSH) Transport layer Protocol specifies that servers and clients should support groups with a modulus length of  $k$  bits, where the recommended minimum value is 1024 bits. Recent security research has shown that a minimum value of 1024 bits is insufficient against state-sponsored actors. As such, this document formally updates [RFC 4419](#) [[RFC4419](#)] such that the minimum recommended value for  $k$  is 2048 bits and the group size is 2048 bits at minimum.

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Internet-Draft

Recommended minimum modulus size

April 2017

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## Table of Contents

<a href="#">1.</a>	Introduction . . . . .	<a href="#">2</a>
<a href="#">1.1.</a>	Requirements Language . . . . .	<a href="#">2</a>
<a href="#">2.</a>	2048 bits DH Group . . . . .	<a href="#">2</a>
<a href="#">3.</a>	Security Considerations . . . . .	<a href="#">2</a>
<a href="#">4.</a>	References . . . . .	<a href="#">3</a>
<a href="#">4.1.</a>	Normative References . . . . .	<a href="#">3</a>
<a href="#">4.2.</a>	Informative References . . . . .	<a href="#">3</a>
	Author's Address . . . . .	<a href="#">3</a>

## [1.](#) Introduction

[RFC4419](#) [[RFC4419](#)] specifies a recommended minimum size of 1024 bits for  $k$ , which is the modulus length of the DH Group. It also suggests that in all cases, the size of the group needs be at least 1024 bits. This document updates [RFC 4419](#) [[RFC4419](#)] so that the minimum recommended size be 2048 bits.

### [1.1.](#) Requirements Language

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 [RFC 2119](#) [[RFC2119](#)].

## [2.](#) 2048 bits DH Group

Recent research [[LOGJAM](#)] strongly suggests that DH groups that are 1024 bits can be broken by state actors, and possibly an organization with enough computing resources. The authors show how they are able to break 768 bits DH group and extrapolate the attack to 1024 bits DH groups. In their analysis, they show that breaking 1024 bits can be done with enough computing resources. This document updates [section 3](#) Paragraph 9 : Servers and clients SHOULD support groups with a modulus length of  $k$  bits where  $2048 \leq k \leq 8192$ . The recommended minimum values for min and max are 2048 and 8192, respectively. This document also updates [Section 3](#) Paragraph 11: In all cases, the size of the group SHOULD be at least 2048 bits.

### [3.](#) Security Considerations

This document discusses security issues of DH groups that are 1024 bits in size, and formally updates the minimum size of DH groups to be 2048 bits.

Velvindron

Expires October 20, 2017

[Page 2]

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Internet-Draft

Recommended minimum modulus size

April 2017

### [4.](#) References

#### [4.1.](#) Normative References

[LOGJAM] Adrian, D., Bhargavan, K., Durumeric, Z., Gaudry, P., Green, M., Halderman, J., Heninger, N., Springall, D., ThomA(C), E., Valenta, L., VanderSloot, B., Wustrow, E., Zanella-BA(C)guelin, S., and P. Zimmermann, "Imperfect Forward Secrecy: How Diffie-Hellman Fails in Practice", ACM Conference on Computer and Communications Security (CCS) 2015, 2015, <<https://weakdh.org/imperfect-forward-secrecy-ccs15.pdf>>.

[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>>.

#### [4.2.](#) Informative References

[RFC4419] Friedl, M., Provos, N., and W. Simpson, "Diffie-Hellman Group Exchange for the Secure Shell (SSH) Transport Layer Protocol", [RFC 4419](#), DOI 10.17487/RFC4419, March 2006, <<http://www.rfc-editor.org/info/rfc4419>>.

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Velvindron

Expires October 20, 2017

[Page 3]