Increase SSH minimum recommended DH modulus size to 2048 bits
draft-ietf-curdle-ssh-dh-group-exchange-05

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, and possibly an organization with enough computing resources. As such, this document formally updates the specification such that the minimum recommended value for k is 2048 bits and the group size is 2048 bits at minimum. This RFC updates RFC4419 which allowed for DH moduli less than 2048 bits.

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 http://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 January 18, 2018.

Copyright Notice

Copyright (c) 2017 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 (http://trustee.ietf.org/license-info) in effect on the date of
1. Introduction

[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 [RFC4419] so that the minimum recommended size be 2048 bits. This recommendation is based on recent research [LOGJAM] on DH Group weaknesses.

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 provides the following recommendation: SSH Servers and SSH clients SHOULD support groups with a modulus length of k bits where 2048 <= k <= 8192.

[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 [RFC4419] as described below:

- Section 3 Paragraph 9: Servers and clients SHOULD support groups
  with a modulus length of k bits where 2048 ≤ k ≤ 8192. The
  recommended minimum values for min and max are 2048 and 8192,
  respectively.

- Section 3 Paragraph 11: In all cases, the size of the group SHOULD
  be at least 2048 bits.

3. Interoperability

This document keeps the [RFC4419] requirement "The server should
return the smallest group it knows that is larger than the size the
client requested. If the server does not know a group that is larger
than the client request, then it SHOULD return the largest group it
knows." and updates the sentence that follows to read: "In all cases,
the size of the returned group SHOULD be at least 2048 bits."

4. 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. A hostile or "owned" Secure Shell server
implementation could potentially use Backdoored Diffie-Hellman primes
using the methods described in [Backdoor-DH] to provide the g, p
values to be used. Or, they could just send the calculated secret
through a covert channel of some sort to a passive listener.

5. IANA Considerations

This document contains no considerations for IANA.

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,

6.2. Informative References
[Backdoor-DH]
Wong, D., "How to Backdoor Diffie-Hellman", Cryptology ePrint Archive Report 2016/644, June 2016,

[LOGJAM]

[RFC4419]

Authors’ Addresses

Loganaden Velvindron
Hackers.mu
88, Avenue De Plevitz
Roches Brunes
MU

Phone: +230 59762817
Email: logan@hackers.mu

Mark D. Baushke
Juniper Networks, Inc.

Email: mdb@juniper.net