

Independent Submission  
Request for Comments: 8479  
Category: Informational  
ISSN: 2070-1721

N. Mavrogiannopoulos  
Red Hat  
September 2018

## Storing Validation Parameters in PKCS#8

### Abstract

This memo describes a method of storing parameters needed for private-key validation in the Private-Key Information Syntax Specification as defined in PKCS#8 format (RFC 5208). It is equally applicable to the alternative implementation of the Private-Key Information Syntax Specification as defined in RFC 5958.

The approach described in this document encodes the parameters under a private enterprise extension and does not form part of a formal standard.

### Status of This Memo

This document is not an Internet Standards Track specification; it is published for informational purposes.

This is a contribution to the RFC Series, independently of any other RFC stream. The RFC Editor has chosen to publish this document at its discretion and makes no statement about its value for implementation or deployment. Documents approved for publication by the RFC Editor are not candidates for any level of Internet Standard; see Section 2 of RFC 7841.

Information about the current status of this document, any errata, and how to provide feedback on it may be obtained at <https://www.rfc-editor.org/info/rfc8479>.

### Copyright Notice

Copyright (c) 2018 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.

## Table of Contents

1. Introduction . . . . .	3
2. ValidationParams Attribute . . . . .	3
3. Example Structure . . . . .	4
4. Compatibility Notes . . . . .	4
5. Security Considerations . . . . .	5
6. IANA Considerations . . . . .	5
7. References . . . . .	5
7.1. Normative References . . . . .	5
7.2. Informative References . . . . .	6
Appendix A. ASN.1 Module . . . . .	7
Acknowledgements . . . . .	8
Author's Address . . . . .	8

## 1. Introduction

RSA or DSA private keys generated using the Shawe-Taylor prime generation algorithm described in [FIPS186-4] allow for parameter validation, i.e., they verify whether the primes are actually prime and were correctly generated. That is done by generating the parameters from a known seed and a selected hash algorithm.

Storing these parameters in a private-key format such as the RSA Private-Key Syntax from PKCS#1 [RFC8017] or common representations for DSA private keys does not allow information needed for validation to be attached to the parameters. The purpose of this document is to describe such a method using the Private-Key Information Syntax Specification as defined in [RFC5208] and the alternative specification described in [RFC5958].

The approach described in this document encodes the parameters under a private enterprise extension and does not form part of a formal standard. The encoding can be used as is or as the basis for a standard at a later time.

## 2. ValidationParams Attribute

The information related to the validation parameters is stored as an attribute in the PrivateKeyInfo structure. The attribute is identified by the id-attr-validation-parameters object identifier and contains as AttributeValue a single ValidationParams structure.

```
id-attr-validation-parameters OBJECT IDENTIFIER ::=
    {1 3 6 1 4 1 2312 18 8 1}

ValidationParams ::= SEQUENCE {
    hashAlgo OBJECT IDENTIFIER,
    seed OCTET STRING
}
```

The algorithm identifier in ValidationParams should be a hash algorithm identifier for the methods described in [FIPS186-4]. The ValidationParams sequence must be DER encoded [ITU-T-X690].

### 3. Example Structure

The following structure contains an RSA key generated using the algorithm from Section B.3.3 of [FIPS186-4], with SHA2-384 hash. The seed used is 8af4328c87bebcec31e303b8f5537effcb6a91d947084d99a369823b36f01462 (hex encoded).

```
-----BEGIN PRIVATE KEY-----
MIIE/gIBADANBgkqhkiG9w0BAQEFAASCBCwggSjAgEAAoIBAQCpPwXwfhDsWA3q
jN2BWg1xfDjvZDVNfgTV/b95g304Aty3z13xPXAhHZ3ROW3pgPxTj9fiq7ZMy4Ua
gMpPK81v3pHX1luokC2KcGXbgbAq2Q8ClxSXgEJllRwDENufjEdV10gArt8NlIP0N
lotalkQUuI1DMSqc5DTIa35Nq4j1GW+KmltP0kCrGq9fMGwjDbPEpSp9DTquEMHJ
o7kyJIjB+93ikLvBUTgboxr+jcnTLXuhA8rC8r+KXre4NPPNPRyefRcALLt/URvFA
rTvFOQfi3vIjNhBZL5FdC+FVar5QnF3r2+cuDPbnczr4/rr81kzFGWrwyAgF5FWu
pFtB5IYDAgMBAAECggEAHZ88vGNsNdmRkfhWupGW4cKCuo+Y7re8Q/H2Jd/4Nin2
FKvUPuloaztiSGDbVm+vejama/Nu5FEIumNJRyMeoVJcx2DDuUx01ZBlaIEwfMct
/Dwd0/JDzuCXB0Cu5GTWLh1z0zMGHXihIdQ0DtGKt++3Ncg5gy1D+cIqqJB515/z
jYdZmb0Wqmqz7H3DisuxvnhiCAOuNrcDau80hpMA9TQ1b+XKNGHIBgKpJe6lnB0P
MsS/AjDiDoEpP9GG9mv9+96rAga4Nos6avYlwWwbC6d+hHIWvWEWsmrDfcJlm2gN
tjvG8omj00t5dAt7qGhfOoNDGr5tvJVo/g960/0I8QKBgQDdzytVRulo9aKVdAYW
/Nj04thtnRaqsTyFH+7ibEVwNIUuld/Bp6NnuGrY+K1siX8+zA9f8mKxuXXV9KK4
089Ypw9js2BxM7VY09Gmp6e1RY3Rrd8w7pG7/KqoPWXkuixTay9eybrJMWu3TT36
q7NheNmBHQcFmSQQuUwEmvp3MQKBgQDDVaisMJkc/sIyQh3Xr1fzmMLK+G1PDucD
w5e50fh18Q5PmTcP20zVLhTevffcqeItSyeAno94Xdzc9vZ/rt69410kJEHyBO9L
CmhtYz94wvSdRhbqf4VzAl2WU184sIYiIZDGsnGScgIYvo6v6mITjRhc8AMdYoPR
rL6xp6frcwKBgFil+avCj6mFzD+fxqu89nyCmXLfiAI+nmjTy7PM/7yP1NB76qDG
Dil2bw1Xj+y/1R9ld6S1CVnxRbqLe+TZLuVS82m5nRHJT3b5fbD8jquGJOE+e+xT
DgA0XoCpBa6D8yRt0uVDIyxCUsvd5DL0JusN7VehzcUEaZMyuL+CyDeRAoGBAImB
qH6mq3Kc6Konnw1w4ttJ436sxr1vuTKOIyYdZBNB0Zg5PGi+MWU0z15LDroLi3v1
FwbVGBxcvxkSBU63FHhKMqW7Ne0gii+iQQcYQdtKKpb4ezNS1+exd5WTIcExtgL
tvYZMhgsh8trgflWpXor7kWmdBrgef1FiOxZIL1/AoGAeBP7sdE+gzsh8jqFnrVrj
7nOg+YllJAlwsf7cTH4pLIy2Eo9D+cNjhL9LK6RaAd7PSZladm8HfaROA2cfCm84
RI4c7Ue0G+N6LZiFvC0Bfi5SaPVAExXoty8UqjOCozavSaXBPuNcTXZuzswcgbxI
G5/kaJNHoEcddlVsPsYWKRNKgpZa9BgorBgEEAZIIEggBMS8wLQYJYIZIAWUDBAIC
BCKK9DKMh7687DHjA7j1U37/y2qR2UcITZmjaYI7NvAUyG==
-----END PRIVATE KEY-----
```

### 4. Compatibility Notes

For compatibility, it is recommended that implementations following this document support generation and validation using the SHA2-384 hash algorithm.

The extension defined in this document is applicable both to the Private-Key Information Syntax Specification (PKCS#8) [RFC5208] and to Asymmetric Key Packages [RFC5958].

## 5. Security Considerations

All the considerations in [RFC5208] and [RFC5958] apply.

## 6. IANA Considerations

This document has no IANA actions.

## 7. References

### 7.1. Normative References

[FIPS186-4]

National Institute of Standards and Technology, "Digital Signature Standard (DSS)", FIPS PUB 186-4, DOI 10.6028/NIST.FIPS.186-4, July 2013.

[ITU-T-X680]

International Telecommunication Union, "Abstract Syntax Notation One (ASN.1): Specification of basic notation", ITU-T Recommendation X.680, July 2002, <<https://www.itu.int/ITU-T/studygroups/com17/languages/X.680-0207.pdf>>.

[ITU-T-X690]

International Telecommunication Union, "ASN.1 encoding rules: Specification of Basic Encoding Rules (BER), Canonical Encoding Rules (CER) and Distinguished Encoding Rules (DER)", ITU-T Recommendation X.690, July 2002, <<https://www.itu.int/ITU-T/studygroups/com17/languages/X.690-0207.pdf>>.

[RFC5208] Kaliski, B., "Public-Key Cryptography Standards (PKCS) #8: Private-Key Information Syntax Specification Version 1.2", RFC 5208, DOI 10.17487/RFC5208, May 2008, <<https://www.rfc-editor.org/info/rfc5208>>.

[RFC5958] Turner, S., "Asymmetric Key Packages", RFC 5958, DOI 10.17487/RFC5958, August 2010, <<https://www.rfc-editor.org/info/rfc5958>>.

## 7.2. Informative References

- [RFC5912] Hoffman, P. and J. Schaad, "New ASN.1 Modules for the Public Key Infrastructure Using X.509 (PKIX)", RFC 5912, DOI 10.17487/RFC5912, June 2010, <<https://www.rfc-editor.org/info/rfc5912>>.
- [RFC8017] Moriarty, K., Ed., Kaliski, B., Jonsson, J., and A. Rusch, "PKCS #1: RSA Cryptography Specifications Version 2.2", RFC 8017, DOI 10.17487/RFC8017, November 2016, <<https://www.rfc-editor.org/info/rfc8017>>.

## Appendix A. ASN.1 Module

This appendix provides non-normative ASN.1 definitions for the structures described in this specification using ASN.1 as defined in [ITU-T-X680] and [RFC5912].

```
PrivateKeyValidationAttrV1
  { iso(1) identified-organization(3) dod(6) internet(1)
    private(4) enterprise(1) 2312 18 1 1 }

DEFINITIONS IMPLICIT TAGS ::=

BEGIN

-- EXPORTS ALL

IMPORTS

ATTRIBUTE
FROM PKIX-CommonTypes-2009 -- [RFC5912]
  { iso(1) identified-organization(3) dod(6) internet(1)
    security(5) mechanisms(5) pkix(7) id-mod(0)
    id-mod-pkixCommon-02(57) } ;

-- PrivateKeyInfo is defined in [RFC5208].
-- This definition adds the validation parameters attribute
-- to the set of allowed attributes.

PrivateKeyInfo ATTRIBUTE ::= {
  at-validation-parameters, ... }

at-validation-parameters ATTRIBUTE ::= {
  TYPE ValidationParams
  IDENTIFIED BY id-attr-validation-parameters }

id-attr-validation-parameters OBJECT IDENTIFIER ::=
  { 1 3 6 1 4 1 2312 18 8 1 }

ValidationParams ::= SEQUENCE {
  hashAlg OBJECT IDENTIFIER,
  seed OCTET STRING }

END
```

Acknowledgements

The author would like to thank Russ Housley for his comments and the ASN.1 module appendix.

Author's Address

Nikos Mavrogiannopoulos  
Red Hat, Inc.  
Brno  
Czech Republic

Email: nmav@redhat.com