

Secure Inter-Domain Routing Working Group
Internet-Draft
Updates: [6485bis](#) (if approved)
Intended status: Standards Track
Expires: October 23, 2016

S. Turner
IECA, Inc.
April 21, 2016

BGPsec Algorithms, Key Formats, & Signature Formats
draft-ietf-sidr-bgpsec-algs-15

Abstract

This document specifies the algorithms, algorithm parameters, asymmetric key formats, asymmetric key size and signature format used in BGPsec (Border Gateway Protocol Security). This document updates the Profile for Algorithms and Key Sizes for Use in the Resource Public Key Infrastructure (ID.sidr-rfc6485bis).

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."

Copyright Notice

Copyright (c) 2016 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 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
1.1.	Terminology	3
2.	Algorithms	3
3.	Asymmetric Key Pair Formats	3
3.1.	Public Key Format	4
3.2.	Private Key Format	4
4.	Signature Format	4
5.	Additional Requirements	4
6.	Security Considerations	4
7.	IANA Considerations	5
8.	Acknowledgements	5
9.	References	5
9.1.	Normative References	5
9.2.	Informative References	7
	Authors' Addresses	7

[1.](#) Introduction

This document specifies:

- o the digital signature algorithm and parameters;
- o the hash algorithm and parameters;
- o the public and private key formats; and,
- o the signature format

used by Resource Public Key Infrastructure (RPKI) Certification Authorities (CA), and BGPsec (Border Gateway Protocol Security) speakers (i.e., routers). CAs use these algorithms when processing requests for BGPsec Router Certificates [ID.sidr-bgpsec-pki-profiles]. Examples when BGPsec routers use these algorithms include requesting BGPsec certificates [[ID.sidr-bgpsec-pki-profiles](#)], signing BGPsec Update messages [[ID.sidr-bgpsec-protocol](#)], and verifying BGPsec Update messages [[ID.sidr-bgpsec-protocol](#)].

This document updates [[ID.sidr-rfc6485bis](#)] to add support for a) a different algorithm for BGPsec certificate requests, which are issued only by BGPsec speakers; b) a different Subject Public Key Info format for BGPsec certificates, which is needed for the specified BGPsec signature algorithm; and, c) a different signature format for BGPsec signatures, which is needed for the specified BGPsec signature algorithm. The BGPsec certificate are differentiated from other RPKI certificates by the use of the BGPsec Extended Key Usage defined in [[ID.sidr-bgpsec-pki-profiles](#)].

Turner

Expires October 23, 2016

[Page 2]

1.1. Terminology

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 [\[RFC2119\]](#).

2. Algorithms

The algorithms used to compute signatures on CA certificates, BGPsec Router Certificates, and CRLs are as specified in Section 2 of [\[ID.sidr-rfc6485bis\]](#). This section addresses BGPsec algorithms, for example these algorithms are used by BGPsec routers to request BGPsec certificates, by RPKI CAs to verify BGPsec certification requests, by BGPsec routers to generate BGPsec Update messages, and by BGPsec routers to verify BGPsec Update message:

- o The signature algorithm used MUST be the Elliptic Curve Digital Signature Algorithm (ECDSA) with curve P-256 [\[RFC6090\]](#)[DSS].
- o The hash algorithm used MUST be SHA-256 [\[SHS\]](#).

Hash algorithms are not identified by themselves in certificates or BGPsec Update messages. They are represented by an OID that combines the hash algorithm with the digital signature algorithm as follows:

- o The ecdsa-with-SHA256 OID [\[RFC5480\]](#) MUST appear in the PKCS #10 signatureAlgorithm field [\[RFC2986\]](#) or in Certificate Request Message Format (CRMF) POPOSigningKey algorithm field [\[RFC4211\]](#), which location depends on the certificate request format generated.
- o In BGPsec Update messages, the ECDSA with SHA-256 Algorithm Suite Identifier from [Section 7](#) is included in the Signature-Block List's Algorithm Suite Identifier field.

3. Asymmetric Key Pair Formats

The key formats used to compute signatures on CA certificates, BGPsec Router Certificates, and CRLs are as specified in Section 3 of [\[ID.sidr-rfc6485bis\]](#). This section addresses key formats found in the BGPsec router certificate requests and in BGPsec Router Certificates.

The ECDSA private keys used to compute signatures for certificate requests and BGPsec Update messages MUST come from the P-256 curve [\[RFC5480\]](#). The public key pair MUST use the uncompressed form.

3.1. Public Key Format

The Subject's public key is included in subjectPublicKeyInfo [RFC5280]. It has two sub-fields: algorithm and subjectPublicKey. The values for the structures and their sub-structures follow:

- o algorithm (an AlgorithmIdentifier type): The id-ecPublicKey OID MUST be used in the algorithm field, as specified in [Section 2.1.1 of \[RFC5480\]](#). The value for the associated parameters MUST be secp256r1, as specified in [Section 2.1.1.1 of \[RFC5480\]](#).
- o subjectPublicKey: ECPoint MUST be used to encode the certificate's subjectPublicKey field, as specified in [Section 2.2 of \[RFC5480\]](#).

3.2. Private Key Format

Local Policy determines private key format.

4. Signature Format

The structure for the certificate's and CRL's signature field MUST be as specified in Section 4 of [\[ID.sidr-rfc6485bis\]](#), which is the same format used by other RPKI certificates. The structure for the certification request's and BGPsec Update message's signature field MUST be as specified in [Section 2.2.3 of \[RFC3279\]](#).

5. Additional Requirements

It is anticipated that BGPsec will require the adoption of updated key sizes and a different set of signature and hash algorithms over time, in order to maintain an acceptable level of cryptographic security. This profile should be updated to specify such future requirements, when appropriate.

The recommended procedures to implement such a transition of key sizes and algorithms is specified in [\[RFC6916\]](#).

6. Security Considerations

The Security Considerations of [\[RFC3279\]](#), [\[RFC5480\]](#), [\[RFC6090\]](#), [\[ID.sidr-rfc6485bis\]](#), and [\[ID.sidr-bgpsec-pki-profiles\]](#) apply to certificates. The security considerations of [\[RFC3279\]](#), [\[RFC6090\]](#), [\[ID.sidr-rfc6485bis\]](#), [\[ID.sidr-bgpsec-pki-profiles\]](#) apply to certification requests. The security considerations of [\[RFC3279\]](#), [\[ID.sidr-bgpsec-protocol\]](#), and [\[RFC6090\]](#) apply to BGPsec Update messages. No new security considerations are introduced as a result of this specification.

7. IANA Considerations

The Internet Assigned Numbers Authority (IANA) is requested to define the "BGPsec Algorithm Suite Registry" described below in the Resource Public Key Infrastructure (RPKI) group.

An algorithm suite consists of a digest algorithm and a signature algorithm. This specification creates an IANA registry of one-octet BGPsec algorithm suite identifiers. Additionally, this document registers a single algorithm suite which uses the digest algorithm SHA-256 and the signature algorithm ECDSA on the P-256 curve [[RFC5480](#)].

BGPsec Algorithm Suites Registry

Digest Algorithm	Signature Algorithm	Algorithm Suite Identifier	Specification Pointer
Reserved	Reserved	0x0	This draft
SHA-256	ECDSA P-256	TBD	RFC 5480
Unassigned	Unassigned	TBD+1..0xE	This draft
Reserved	Reserved	0xF	This draft

Future assignments are to be made using either the Standards Action process defined in [[RFC5226](#)], or the Early IANA Allocation process defined in [[RFC7120](#)]. Assignments consist of a digest algorithm name, signature algorithm name, and the algorithm suite identifier value.

8. Acknowledgements

The author wishes to thank Geoff Huston and George Michaelson for producing [[ID.sidr-rfc6485bis](#)], which this document is entirely based on. I'd also like to thank Roque Gagliano, David Mandelberg, Tom Petch, Sam Weiller, and Stephen Kent for their reviews and comments.

9. References

9.1. Normative References

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", [BCP 14](#), [RFC 2119](#), March 1997.

- [RFC2986] Nystrom, M. and B. Kaliski, "PKCS #10: Certification Request Syntax Specification Version 1.7", [RFC 2986](#), November 2000.
- [RFC3279] Bassham, L., Polk, W., and R. Housley, "Algorithms and Identifiers for the Internet X.509 Public Key Infrastructure Certificate and Certificate Revocation List (CRL) Profile", [RFC 3279](#), April 2002.
- [RFC4211] Schaad, J., "Internet X.509 Public Key Infrastructure Certificate Request Message Format (CRMF)", [RFC 4211](#), September 2005.
- [RFC5226] Narten, T. and H. Alvestrand, "Guidelines for Writing an IANA Considerations Section in RFCs", [BCP 26](#), [RFC 5226](#), May 2008.
- [RFC5280] Cooper, D., Santesson, S., Farrell, S., Boeyen, S., Housley, R., and W. Polk, "Internet X.509 Public Key Infrastructure Certificate and Certificate Revocation List (CRL) Profile", [RFC 5280](#), May 2008.
- [RFC5480] Turner, S., Brown, D., Yiu, K., Housley, R., and T. Polk, "Elliptic Curve Cryptography Subject Public Key Information", [RFC 5480](#), March 2009.
- [RFC6090] McGrew, D., Igoe, K., and M. Salter, "Fundamental Elliptic Curve Cryptography Algorithms", [RFC 6090](#), February 2011.
- [RFC6916] Gagliano, R., Kent, S., and S. Turner, "Algorithm Agility Procedure for the Resource Public Key Infrastructure (RPKI)", [BCP 182](#), [RFC 6916](#), April 2013.
- [RFC7120] Cotton, M., "Early IANA Allocation of Standards Track Code Points", [BCP 100](#), [RFC 7120](#), January 2014.
- [ID.sidr-rfc6485bis] Huston, G., and G. Michaelson, "The Profile for Algorithms and Key Sizes for use in the Resource Public Key Infrastructure", [draft-ietf-sidr-rfc6485bis](#), work-in-progress.
- [ID.sidr-bgpsec-protocol] Lepinski, M., "BGPsec Protocol Specification", [draft-ietf-sidr-bgpsec-protocol](#), work-in-progress.

Turner

Expires October 23, 2016

[Page 6]

[ID.sidr-bgpsec-pki-profiles] Reynolds, M. and S. Turner, "A Profile for BGPSEC Router Certificates, Certificate Revocation Lists, and Certification Requests", [draft-ietf-sidr-bgpsec-pki-profiles](#), work-in-progress.

[DSS] National Institute of Standards and Technology (NIST), U.S. Department of Commerce, "Digital Signature Standard", FIPS Publication 186-4, July 2013.

[SHS] National Institute of Standards and Technology (NIST), U.S. Department of Commerce, "Secure Hash Standard", FIPS Publication 180-4, August 2015.

[9.2.](#) Informative References

None.

Authors' Addresses

Sean Turner
IECA, Inc.
3057 Nutley Street, Suite 106
Fairfax, VA 22031
USA

EMail: turners@ieca.com

