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Common YANG Data Types for Cryptography
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Abstract

This document defines YANG identities and typedefs useful for cryptographic applications.

Editorial Note (To be removed by RFC Editor)

This draft contains many placeholder values that need to be replaced with finalized values at the time of publication. This note summarizes all of the substitutions that are needed. No other RFC Editor instructions are specified elsewhere in this document.

Artwork in this document contains shorthand references to drafts in progress. Please apply the following replacements:

- o "XXXX" --> the assigned RFC value for this draft

Artwork in this document contains placeholder values for the date of publication of this draft. Please apply the following replacement:

- o "2018-06-04" --> the publication date of this draft

The following Appendix section is to be removed prior to publication:

- o Appendix A. Change Log

Status of This Memo

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

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1. Introduction

This document defines a YANG 1.1 [RFC7950] module specifying identities and typedefs useful for cryptography.

As the YANG module only defines identities and typedefs, this draft does not present a YANG tree diagram [RFC8340] or any examples illustrating usage of the module.

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 capitals, as shown here.

2. YANG Module

This module has normative references for [RFC4253], [RFC5280], [RFC5480], [RFC5652], and [ITU.X690.2015] and has informational references to [RFC6234] and [RFC8017]

```
<CODE BEGINS> file "ietf-crypto-types@2018-06-04.yang"
module ietf-crypto-types {
  yang-version 1.1;

  namespace "urn:ietf:params:xml:ns:yang:ietf-crypto-types";
  prefix "ct";

  organization
    "IETF NETCONF (Network Configuration) Working Group";

  contact
    "WG Web:    <http://datatracker.ietf.org/wg/netconf/>
    WG List:    <mailto:netconf@ietf.org>

    Author:     Kent Watsen
                <mailto:kwatsen@juniper.net>";

  description
    "This module defines common YANG types for cryptographic
    applications.

    Copyright (c) 2018 IETF Trust and the persons identified
    as authors of the code. All rights reserved.

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    BSD License set forth in Section 4.c of the IETF Trust's
    Legal Provisions Relating to IETF Documents
    (http://trustee.ietf.org/license-info).

    This version of this YANG module is part of RFC XXXX; see
    the RFC itself for full legal notices."

  revision "2018-06-04" {
    description
      "Initial version";
    reference
      "RFC XXXX: Common YANG Data Types for Cryptography";
```

```
}

/*****/
/* Identities for Hashing Algorithms */
/*****/

identity hash-algorithm {
  description
    "A base identity for hash algorithm verification.";
}

identity sha-256 {
  base "hash-algorithm";
  description "The SHA-256 algorithm.";
  reference "RFC 6234: US Secure Hash Algorithms.";
}

/*****/
/* Identities for Key Algorithms */
/*****/

identity key-algorithm {
  description
    "Base identity from which all key-algorithms are derived.";
}

identity rsa1024 {
  base key-algorithm;
  description
    "The RSA algorithm using a 1024-bit key.";
  reference
    "RFC 8017:
      PKCS #1: RSA Cryptography Specifications Version 2.2.";
}

identity rsa2048 {
  base key-algorithm;
  description
    "The RSA algorithm using a 2048-bit key.";
  reference
    "RFC 8017:
      PKCS #1: RSA Cryptography Specifications Version 2.2.";
}

identity rsa3072 {
  base key-algorithm;
  description
```

```
    "The RSA algorithm using a 3072-bit key.";
  reference
    "RFC 8017:
      PKCS #1: RSA Cryptography Specifications Version 2.2.";
}

identity rsa4096 {
  base key-algorithm;
  description
    "The RSA algorithm using a 4096-bit key.";
  reference
    "RFC 8017:
      PKCS #1: RSA Cryptography Specifications Version 2.2.";
}

identity rsa7680 {
  base key-algorithm;
  description
    "The RSA algorithm using a 7680-bit key.";
  reference
    "RFC 8017:
      PKCS #1: RSA Cryptography Specifications Version 2.2.";
}

identity rsa15360 {
  base key-algorithm;
  description
    "The RSA algorithm using a 15360-bit key.";
  reference
    "RFC 8017:
      PKCS #1: RSA Cryptography Specifications Version 2.2.";
}

identity secp192r1 {
  base key-algorithm;
  description
    "The secp192r1 algorithm.";
  reference
    "RFC 5480: Elliptic Curve Cryptography Subject Public
      Key Information.";
}

identity secp256r1 {
  base key-algorithm;
  description
    "The secp256r1 algorithm.";
  reference
    "RFC 5480: Elliptic Curve Cryptography Subject Public
```

```
        Key Information.";
    }

    identity secp384r1 {
        base key-algorithm;
        description
            "The secp384r1 algorithm.";
        reference
            "RFC 5480: Elliptic Curve Cryptography Subject Public
            Key Information.";
    }

    identity secp521r1 {
        base key-algorithm;
        description
            "The secp521r1 algorithm.";
        reference
            "RFC 5480: Elliptic Curve Cryptography Subject Public
            Key Information.";
    }

    /*
     * Typedefs for identityrefs to above base identities
     */
    typedef hash-algorithm-ref {
        type identityref {
            base "hash-algorithm";
        }
        description
            "This typedef enables importing modules to easily define an
            identityref to the 'hash-algorithm' base identity.";
    }

    typedef key-algorithm-ref {
        type identityref {
            base "key-algorithm";
        }
        description
            "This typedef enables importing modules to easily define an
            identityref to the 'key-algorithm' base identity.";
    }

    /*
     * Typedefs for ASN.1 structures from RFC 5280
     */
```

```
typedef x509 {
  type binary;
  description
    "A Certificate structure, as specified in RFC 5280,
    encoded using ASN.1 distinguished encoding rules (DER),
    as specified in ITU-T X.690.";
  reference
    "RFC 5280:
      Internet X.509 Public Key Infrastructure Certificate
      and Certificate Revocation List (CRL) Profile
    ITU-T X.690:
      Information technology - ASN.1 encoding rules:
      Specification of Basic Encoding Rules (BER),
      Canonical Encoding Rules (CER) and Distinguished
      Encoding Rules (DER).";
}

typedef crl {
  type binary;
  description
    "A CertificateList structure, as specified in RFC 5280,
    encoded using ASN.1 distinguished encoding rules (DER),
    as specified in ITU-T X.690.";
  reference
    "RFC 5280:
      Internet X.509 Public Key Infrastructure Certificate
      and Certificate Revocation List (CRL) Profile
    ITU-T X.690:
      Information technology - ASN.1 encoding rules:
      Specification of Basic Encoding Rules (BER),
      Canonical Encoding Rules (CER) and Distinguished
      Encoding Rules (DER).";
}

/*****
/*   Typedefs for ASN.1 structures from 5652   */
*****/

typedef cms {
  type binary;
  description
    "A ContentInfo structure, as specified in RFC 5652,
    encoded using ASN.1 distinguished encoding rules (DER),
    as specified in ITU-T X.690.";
  reference
    "RFC 5652:
      Cryptographic Message Syntax (CMS)
    ITU-T X.690:
```

```
        Information technology - ASN.1 encoding rules:
        Specification of Basic Encoding Rules (BER),
        Canonical Encoding Rules (CER) and Distinguished
        Encoding Rules (DER).";
    }

    typedef data-content-cms {
        type cms;
        description
            "A CMS structure whose top-most content type MUST be the
            data content type, as described by Section 4 in RFC 5652.";
        reference
            "RFC 5652: Cryptographic Message Syntax (CMS)";
    }

    typedef signed-data-cms {
        type cms;
        description
            "A CMS structure whose top-most content type MUST be the
            signed-data content type, as described by Section 5 in
            RFC 5652.";
        reference
            "RFC 5652: Cryptographic Message Syntax (CMS)";
    }

    typedef enveloped-data-cms {
        type cms;
        description
            "A CMS structure whose top-most content type MUST be the
            enveloped-data content type, as described by Section 6
            in RFC 5652.";
        reference
            "RFC 5652: Cryptographic Message Syntax (CMS)";
    }

    typedef digested-data-cms {
        type cms;
        description
            "A CMS structure whose top-most content type MUST be the
            digested-data content type, as described by Section 7
            in RFC 5652.";
        reference
            "RFC 5652: Cryptographic Message Syntax (CMS)";
    }

    typedef encrypted-data-cms {
        type cms;
        description
```

```
        "A CMS structure whose top-most content type MUST be the
        encrypted-data content type, as described by Section 8
        in RFC 5652.";
    reference
        "RFC 5652: Cryptographic Message Syntax (CMS)";
}

typedef authenticated-data-cms {
    type cms;
    description
        "A CMS structure whose top-most content type MUST be the
        authenticated-data content type, as described by Section 9
        in RFC 5652.";
    reference
        "RFC 5652: Cryptographic Message Syntax (CMS)";
}

/*****
/*  Typedefs for structures related to RFC 4253  */
*****/

typedef ssh-host-key {
    type binary;
    description
        "The binary public key data for this SSH key, as
        specified by RFC 4253, Section 6.6, i.e.:"

        string      certificate or public key format
                    identifier
        byte[n]     key/certificate data.";
    reference
        "RFC 4253: The Secure Shell (SSH) Transport Layer
        Protocol";
}

/*****
/*  Typedefs for ASN.1 structures related to RFC 5280  */
*****/

typedef trust-anchor-cert-x509 {
    type x509;
    description
        "A Certificate structure that MUST encode a self-signed
        root certificate.";
}

typedef end-entity-cert-x509 {
    type x509;
```

```
description
  "A Certificate structure that MUST encode a certificate
   that is neither self-signed nor having Basic constraint
   CA true.";
}

/*****
/*  Typedefs for ASN.1 structures related to RFC 5652  */
*****/

typedef trust-anchor-cert-cms {
  type signed-data-cms;
  description
    "A CMS SignedData structure that MUST contain the chain of
     X.509 certificates needed to authenticate the certificate
     presented by a client or end-entity.

     The CMS MUST contain only a single chain of certificates.
     The client or end-entity certificate MUST only authenticate
     to last intermediate CA certificate listed in the chain.

     In all cases, the chain MUST include a self-signed root
     certificate. In the case where the root certificate is
     itself the issuer of the client or end-entity certificate,
     only one certificate is present.

     This CMS structure MAY (as applicable where this type is
     used) also contain suitably fresh (as defined by local
     policy) revocation objects with which the device can
     verify the revocation status of the certificates.

     This CMS encodes the degenerate form of the SignedData
     structure that is commonly used to disseminate X.509
     certificates and revocation objects (RFC 5280).";
  reference
    "RFC 5280:
     Internet X.509 Public Key Infrastructure Certificate
     and Certificate Revocation List (CRL) Profile.";
}

typedef end-entity-cert-cms {
  type signed-data-cms;
  description
    "A CMS SignedData structure that MUST contain the end
     entity certificate itself, and MAY contain any number
     of intermediate certificates leading up to a trust
     anchor certificate. The trust anchor certificate
     MAY be included as well."
```

The CMS MUST contain a single end entity certificate.
The CMS MUST NOT contain any spurious certificates.

This CMS structure MAY (as applicable where this type is used) also contain suitably fresh (as defined by local policy) revocation objects with which the device can verify the revocation status of the certificates.

This CMS encodes the degenerate form of the SignedData structure that is commonly used to disseminate X.509 certificates and revocation objects (RFC 5280).";

reference

"RFC 5280:

Internet X.509 Public Key Infrastructure Certificate
and Certificate Revocation List (CRL) Profile.";

}

}

<CODE ENDS>

3. Security Considerations

In order to use YANG identities for algorithm identifiers, only the most commonly used RSA key lengths are supported for the RSA algorithm. Additional key lengths can be defined in another module or added into a future version of this document.

This document limits the number of elliptical curves supported. This was done to match industry trends and IETF best practice (e.g., matching work being done in TLS 1.3). If additional algorithms are needed, they can be defined by another module or added into a future version of this document.

The YANG module defined in this document specifies only typedefs and identities, and hence there are no YANG-specific security considerations that need to be addressed.

4. IANA Considerations

4.1. The IETF XML Registry

This document registers one URI in the "ns" subregistry of the IETF XML Registry [RFC3688]. Following the format in [RFC3688], the following registration is requested:

URI: urn:ietf:params:xml:ns:yang:ietf-crypto-types
Registrant Contact: The NETCONF WG of the IETF.
XML: N/A, the requested URI is an XML namespace.

4.2. The YANG Module Names Registry

This document registers one YANG module in the YANG Module Names registry [RFC6020]. Following the format in [RFC6020], the the following registration is requested:

```
name:          ietf-crypto-types
namespace:     urn:ietf:params:xml:ns:yang:ietf-crypto-types
prefix:        ct
reference:     RFC XXXX
```

5. References

5.1. Normative References

- [ITU.X690.2015]
International Telecommunication Union, "Information Technology - ASN.1 encoding rules: Specification of Basic Encoding Rules (BER), Canonical Encoding Rules (CER) and Distinguished Encoding Rules (DER)", ITU-T Recommendation X.690, ISO/IEC 8825-1, August 2015, <<https://www.itu.int/rec/T-REC-X.690/>>.
- [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>>.
- [RFC4253] Ylonen, T. and C. Lonvick, Ed., "The Secure Shell (SSH) Transport Layer Protocol", RFC 4253, DOI 10.17487/RFC4253, January 2006, <<https://www.rfc-editor.org/info/rfc4253>>.
- [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, DOI 10.17487/RFC5280, May 2008, <<https://www.rfc-editor.org/info/rfc5280>>.
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- [RFC5652] Housley, R., "Cryptographic Message Syntax (CMS)", STD 70, RFC 5652, DOI 10.17487/RFC5652, September 2009, <<https://www.rfc-editor.org/info/rfc5652>>.

- [RFC7950] Bjorklund, M., Ed., "The YANG 1.1 Data Modeling Language", RFC 7950, DOI 10.17487/RFC7950, August 2016, <<https://www.rfc-editor.org/info/rfc7950>>.
- [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>>.

5.2. Informative References

- [RFC3688] Mealling, M., "The IETF XML Registry", BCP 81, RFC 3688, DOI 10.17487/RFC3688, January 2004, <<https://www.rfc-editor.org/info/rfc3688>>.
- [RFC6020] Bjorklund, M., Ed., "YANG - A Data Modeling Language for the Network Configuration Protocol (NETCONF)", RFC 6020, DOI 10.17487/RFC6020, October 2010, <<https://www.rfc-editor.org/info/rfc6020>>.
- [RFC6234] Eastlake 3rd, D. and T. Hansen, "US Secure Hash Algorithms (SHA and SHA-based HMAC and HKDF)", RFC 6234, DOI 10.17487/RFC6234, May 2011, <<https://www.rfc-editor.org/info/rfc6234>>.
- [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>>.
- [RFC8340] Bjorklund, M. and L. Berger, Ed., "YANG Tree Diagrams", BCP 215, RFC 8340, DOI 10.17487/RFC8340, March 2018, <<https://www.rfc-editor.org/info/rfc8340>>.

Appendix A. Change Log

A.1. I-D to 00

- o Removed groupings and notifications.
- o Added typedefs for identityrefs.
- o Added typedefs for other RFC 5280 structures.
- o Added typedefs for other RFC 5652 structures.
- o Added convenience typedefs for RFC 4253, RFC 5280, and RFC 5652.

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