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Common YANG Data Types

Abstract

This document defines a collection of common data types to be used with the YANG data modeling language. It includes several new type definitions and obsoletes RFC 6991.

Status of This Memo

This is an Internet Standards Track document.

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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/rfc9911>.

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Table of Contents

1. Introduction
2. Overview
3. Core YANG Types
4. Internet Protocol Suite Types

5.	IANA Considerations
6.	Security Considerations
7.	References
7.1.	Normative References
7.2.	Informative References
	Acknowledgments
	Author's Address

1. Introduction

YANG [RFC7950] is a data modeling language used to model configuration and state data manipulated by the Network Configuration Protocol (NETCONF) [RFC6241]. The YANG language supports a small set of built-in data types and provides mechanisms to derive other types from the built-in types.

This document defines a collection of common data types. The definitions are organized into two YANG modules:

- * The "ietf-yang-types" module defines generally useful data types such as types for counters and gauges, types related to date and time, and types for common string values (e.g., UUIDs, dotted-quad notation, and language tags).
- * The "ietf-inet-types" module defines data types relevant for the Internet Protocol suite such as types related to IP addresses, types for domain name, host name, URI, and email, and types for values in common protocol fields (e.g., port numbers).

The initial version of these YANG modules was published as [RFC6021]. The first revision of [RFC6021], published as [RFC6991], added several type definitions to the YANG modules. This second revision adds further new type definitions and addresses Erratum IDs 4076 [Err4076] and 5105 [Err5105]. Furthermore, the yang-identifier definition has been aligned with YANG 1.1 [RFC7950], and some pattern statements have been improved. For further details, see the revision statements of the YANG modules in Sections 3 and 4. A brief overview of all types and when they were introduced can be found in Section 2. Additional type definitions may be added in the future by submitting proposals to the NETMOD Working Group.

This document uses the YANG terminology defined in Section 3 of [RFC7950].

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. Overview

Tables 1 and 2 list the types defined in the YANG modules "ietf-yang-types" and "ietf-inet-types". For each type, the name of the type, the base type it was derived from, and the RFC introducing the type is listed.

Type	Base Type	Introduced in
counter32	uint32	RFC 6021
zero-based-counter32	uint32	RFC 6021
counter64	uint64	RFC 6021

zero-based-counter64	uint64	RFC 6021	
+-----+-----+-----+-----+			
gauge32	uint32	RFC 6021	
+-----+-----+-----+-----+			
gauge64	uint64	RFC 6021	
+-----+-----+-----+-----+			
object-identifier	string	RFC 6021	
+-----+-----+-----+-----+			
object-identifier-128	object-identifier	RFC 6021	
+-----+-----+-----+-----+			
date-and-time	string	RFC 6021	
+-----+-----+-----+-----+			
date	string	RFC 9911	
+-----+-----+-----+-----+			
date-no-zone	string	RFC 9911	
+-----+-----+-----+-----+			
time	string	RFC 9911	
+-----+-----+-----+-----+			
time-no-zone	string	RFC 9911	
+-----+-----+-----+-----+			
hours32	int32	RFC 9911	
+-----+-----+-----+-----+			
minutes32	int32	RFC 9911	
+-----+-----+-----+-----+			
seconds32	int32	RFC 9911	
+-----+-----+-----+-----+			
centiseconds32	int32	RFC 9911	
+-----+-----+-----+-----+			
milliseconds32	int32	RFC 9911	
+-----+-----+-----+-----+			
microseconds32	int32	RFC 9911	
+-----+-----+-----+-----+			
microseconds64	int64	RFC 9911	
+-----+-----+-----+-----+			
nanoseconds32	int32	RFC 9911	
+-----+-----+-----+-----+			
nanoseconds64	int64	RFC 9911	
+-----+-----+-----+-----+			
timeticks	int32	RFC 6021	
+-----+-----+-----+-----+			
timestamp	timeticks	RFC 6021	
+-----+-----+-----+-----+			
phys-address	string	RFC 6021	
+-----+-----+-----+-----+			
mac-address	string	RFC 6021	
+-----+-----+-----+-----+			
xpath1.0	string	RFC 6021	
+-----+-----+-----+-----+			
hex-string	string	RFC 6991	
+-----+-----+-----+-----+			
uuid	string	RFC 6991	
+-----+-----+-----+-----+			
dotted-quad	string	RFC 6991	
+-----+-----+-----+-----+			
language-tag	string	RFC 9911	
+-----+-----+-----+-----+			
yang-identifier	string	RFC 6991	
+-----+-----+-----+-----+			

Table 1: Types Defined in the "ietf-yang-types" Module

+=====+	+=====+	+=====+	
Type	Base Type	Introduced in	
+=====+	+=====+	+=====+	
ip-version	enum	RFC 6021	
+-----+	+-----+	+-----+	

dscp	uint8	RFC 6021	
+-----+	+-----+	+-----+	+-----+
ipv6-flow-label	uint32	RFC 6021	
+-----+	+-----+	+-----+	+-----+
port-number	uint16	RFC 6021	
+-----+	+-----+	+-----+	+-----+
protocol-number	uint8	RFC 9911	
+-----+	+-----+	+-----+	+-----+
upper-layer-protocol-number	protocol-number	RFC 9911	
+-----+	+-----+	+-----+	+-----+
as-number	uint32	RFC 6021	
+-----+	+-----+	+-----+	+-----+
ip-address	union	RFC 6021	
+-----+	+-----+	+-----+	+-----+
ipv4-address	string	RFC 6021	
+-----+	+-----+	+-----+	+-----+
ipv6-address	string	RFC 6021	
+-----+	+-----+	+-----+	+-----+
ip-address-no-zone	union	RFC 6991	
+-----+	+-----+	+-----+	+-----+
ipv4-address-no-zone	ipv4-address	RFC 6991	
+-----+	+-----+	+-----+	+-----+
ipv6-address-no-zone	ipv6-address	RFC 6991	
+-----+	+-----+	+-----+	+-----+
ip-address-link-local	union	RFC 9911	
+-----+	+-----+	+-----+	+-----+
ipv4-address-link-local	ipv4-address	RFC 9911	
+-----+	+-----+	+-----+	+-----+
ipv6-address-link-local	ipv6-address	RFC 9911	
+-----+	+-----+	+-----+	+-----+
ip-prefix	union	RFC 6021	
+-----+	+-----+	+-----+	+-----+
ipv4-prefix	string	RFC 6021	
+-----+	+-----+	+-----+	+-----+
ipv6-prefix	string	RFC 6021	
+-----+	+-----+	+-----+	+-----+
ip-address-and-prefix	union	RFC 9911	
+-----+	+-----+	+-----+	+-----+
ipv4-address-and-prefix	string	RFC 9911	
+-----+	+-----+	+-----+	+-----+
ipv6-address-and-prefix	string	RFC 9911	
+-----+	+-----+	+-----+	+-----+
domain-name	string	RFC 6021	
+-----+	+-----+	+-----+	+-----+
host-name	domain-name	RFC 9911	
+-----+	+-----+	+-----+	+-----+
host	union	RFC 6021	
+-----+	+-----+	+-----+	+-----+
uri	string	RFC 6021	
+-----+	+-----+	+-----+	+-----+
email-address	string	RFC 9911	
+-----+	+-----+	+-----+	+-----+

Table 2: Types Defined in the "ietf-inet-types" Module

Some types have an equivalent Structure of Management Information Version 2 (SMIv2) [RFC2578] [RFC2579] data type. A YANG data type is equivalent to an SMIv2 data type if the data types have the same set of values and the semantics of the values are equivalent.

Table 3 lists the types defined in the "ietf-yang-types" YANG module with their corresponding SMIv2 types, and Table 4 lists the types defined in the "ietf-inet-types" module with their corresponding SMIv2 types.

+=====+

YANG type	Equivalent SMIV2 type (module)
counter32	Counter32 (SNMPv2-SMI)
zero-based-counter32	ZeroBasedCounter32 (RMON2-MIB)
counter64	Counter64 (SNMPv2-SMI)
zero-based-counter64	ZeroBasedCounter64 (HCNUM-TC)
gauge32	Gauge32 (SNMPv2-SMI)
gauge64	CounterBasedGauge64 (HCNUM-TC)
object-identifier-128	OBJECT IDENTIFIER
centiseconds32	TimeInterval (SNMPv2-TC)
timeticks	TimeTicks (SNMPv2-SMI)
timestamp	TimeStamp (SNMPv2-TC)
phys-address	PhysAddress (SNMPv2-TC)
mac-address	MacAddress (SNMPv2-TC)
language-tag	LangTag (LANGTAG-TC-MIB)

Table 3: Equivalent SMIV2 Types for the "ietf-yang-types" Module

YANG type	Equivalent SMIV2 type (module)
ip-version	InetVersion (INET-ADDRESS-MIB)
dscp	Dscp (DIFFSERV-DSCP-TC)
ipv6-flow-label	IPv6FlowLabel (IPV6-FLOW-LABEL-MIB)
port-number	InetPortNumber (INET-ADDRESS-MIB)
as-number	InetAutonomousSystemNumber (INET-ADDRESS-MIB)
uri	Uri (URI-TC-MIB)

Table 4: Equivalent SMIV2 Types for the "ietf-inet-types" Module

3. Core YANG Types

The "ietf-yang-types" YANG module references [IEEE-802-2024], [ISO-8601], [ISO-9834-1], [RFC2578], [RFC2579], [RFC2856], [RFC3339], [RFC4502], [RFC5131], [RFC5646], [RFC7950], [RFC9557], [RFC9562], [XPath], and [XSD-TYPES].

```
<CODE BEGINS> file "ietf-yang-types@2025-12-22.yang"
module ietf-yang-types {
  namespace "urn:ietf:params:xml:ns:yang:ietf-yang-types";
  prefix yang;

  organization
    "IETF Network Modeling (NETMOD) Working Group";
  contact
    "WG Web:  <https://datatracker.ietf.org/wg/netmod/>
```

WG List: <mailto:netmod@ietf.org>

Editor: Jrgen Schnwlder
<mailto:jschoenwaelder@constructor.university>;

description

"This module contains a collection of generally useful derived YANG data types.

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 (RFC 2119) (RFC 8174) when, and only when, they appear in all capitals, as shown here.

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This version of this YANG module is part of RFC 9911; see the RFC itself for full legal notices.";

revision 2025-12-22 {

description

"This revision adds the following new data types:

- yang:date
- yang:date-no-zone
- yang:time
- yang:time-no-zone
- yang:hours32
- yang:minutes32
- yang:seconds32
- yang:centiseconds32
- yang:milliseconds32
- yang:microseconds32
- yang:microseconds64
- yang:nanoseconds32
- yang:nanoseconds64
- yang:language-tag

The yang-identifier definition has been aligned with YANG 1.1, and types representing time support the representation of leap seconds. The representation of time zone offsets has been aligned with RFC 9557. Several description and pattern statements have been improved.";

reference

"RFC 9911: Common YANG Data Types";

}

revision 2013-07-15 {

description

"This revision adds the following new data types:

- yang:yang-identifier
- yang:hex-string
- yang:uuid
- yang:dotted-quad";

reference

"RFC 6991: Common YANG Data Types";

}

revision 2010-09-24 {

description

"Initial revision.";

reference

```

    "RFC 6021: Common YANG Data Types";
}

/** collection of counter and gauge types */

typedef counter32 {
    type uint32;
    description
        "The counter32 type represents a non-negative integer
        that monotonically increases until it reaches a
        maximum value of 2^32-1 (4294967295 decimal), when it
        wraps around and starts increasing again from zero.

        Counters have no defined 'initial' value, and thus, a
        single value of a counter has (in general) no information
        content. Discontinuities in the monotonically increasing
        value normally occur at re-initialization of the
        management system and at other times as specified in the
        description of a schema node using this type. If
        discontinuities occur at times other than re-initialization
        (for example, at the instantiation of a schema node of type
        counter32), then a corresponding schema node should be
        defined, with an appropriate type, to indicate the last
        discontinuity.

        The counter32 type should not be used for configuration
        schema nodes. A default statement SHOULD NOT be used in
        combination with the type counter32.

        In the value set and its semantics, this type is equivalent
        to the Counter32 type of the SMIV2.";
    reference
        "RFC 2578: Structure of Management Information Version 2
        (SMIV2)";
}

typedef zero-based-counter32 {
    type counter32;
    default "0";
    description
        "The zero-based-counter32 type represents a counter32
        that has the defined 'initial' value zero.

        A data tree node using this type will be set to zero (0)
        on creation and will thereafter increase monotonically until
        it reaches a maximum value of 2^32-1 (4294967295 decimal),
        when it wraps around and starts increasing again from zero.

        Provided that an application discovers a new data tree node
        using this type within the minimum time to wrap, it can use
        the 'initial' value as a delta. It is important for a
        management station to be aware of this minimum time and the
        actual time between polls, and to discard data if the actual
        time is too long or there is no defined minimum time.

        In the value set and its semantics, this type is equivalent
        to the ZeroBasedCounter32 textual convention of the SMIV2.";
    reference
        "RFC 4502: Remote Network Monitoring Management Information
        Base Version 2";
}

typedef counter64 {
    type uint64;
    description
        "The counter64 type represents a non-negative integer

```

that monotonically increases until it reaches a maximum value of $2^{64}-1$ (18446744073709551615 decimal), when it wraps around and starts increasing again from zero.

Counters have no defined 'initial' value, and thus, a single value of a counter has (in general) no information content. Discontinuities in the monotonically increasing value normally occur at re-initialization of the management system and at other times as specified in the description of a schema node using this type. If discontinuities occur at times other than re-initialization (for example, at the instantiation of a schema node of type counter64), then a corresponding schema node should be defined, with an appropriate type, to indicate the last discontinuity.

The counter64 type should not be used for configuration schema nodes. A default statement SHOULD NOT be used in combination with the type counter64.

In the value set and its semantics, this type is equivalent to the Counter64 type of the SMIV2.;"
reference

"RFC 2578: Structure of Management Information Version 2 (SMIV2)";

}

typedef zero-based-counter64 {

type counter64;

default "0";

description

"The zero-based-counter64 type represents a counter64 that has the defined 'initial' value zero.

A data tree node using this type will be set to zero (0) on creation and will thereafter increase monotonically until it reaches a maximum value of $2^{64}-1$ (18446744073709551615 decimal), when it wraps around and starts increasing again from zero.

Provided that an application discovers a new data tree node using this type within the minimum time to wrap, it can use the 'initial' value as a delta. It is important for a management station to be aware of this minimum time and the actual time between polls, and to discard data if the actual time is too long or there is no defined minimum time.

In the value set and its semantics, this type is equivalent to the ZeroBasedCounter64 textual convention of the SMIV2.;"
reference

"RFC 2856: Textual Conventions for Additional High Capacity Data Types";

}

typedef gauge32 {

type uint32;

description

"The gauge32 type represents a non-negative integer, which may increase or decrease, but shall never exceed a maximum value, nor fall below a minimum value. The maximum value cannot be greater than $2^{32}-1$ (4294967295 decimal), and the minimum value cannot be smaller than 0. The value of a gauge32 has its maximum value whenever the information being modeled is greater than or equal to its maximum value, and has its minimum value whenever the information being modeled is smaller than or equal to its minimum value.

If the information being modeled subsequently decreases below the maximum value, the gauge32 also decreases; likewise, if the information increases above the minimum value, the gauge32 also increases.

In the value set and its semantics, this type is equivalent to the Gauge32 type of the SMIV2.";

reference

"RFC 2578: Structure of Management Information Version 2 (SMIV2)";

}

typedef gauge64 {

type uint64;

description

"The gauge64 type represents a non-negative integer, which may increase or decrease, but shall never exceed a maximum value, nor fall below a minimum value. The maximum value cannot be greater than $2^{64}-1$ (18446744073709551615), and the minimum value cannot be smaller than 0. The value of a gauge64 has its maximum value whenever the information being modeled is greater than or equal to its maximum value, and has its minimum value whenever the information being modeled is smaller than or equal to its minimum value. If the information being modeled subsequently decreases below (increases above) the maximum (minimum) value, the gauge64 also decreases (increases).

In the value set and its semantics, this type is equivalent to the CounterBasedGauge64 SMIV2 textual convention defined in RFC 2856";

reference

"RFC 2856: Textual Conventions for Additional High Capacity Data Types";

}

/** collection of identifier-related types */

typedef object-identifier {

type string {

pattern '([0-1](\.[1-3]?[0-9]))|(2\.(0|([1-9][0-9]*)))' + '(\.(0|([1-9][0-9]*)))';

}

description

"The object-identifier type represents administratively assigned names in a registration-hierarchical-name tree.

Values of this type are denoted as a sequence of numerical non-negative sub-identifier values. Each sub-identifier value MUST NOT exceed $2^{32}-1$ (4294967295). Sub-identifiers are separated by single dots and without any intermediate whitespace.

The ASN.1 standard restricts the value space of the first sub-identifier to 0, 1, or 2. Furthermore, the value space of the second sub-identifier is restricted to the range 0 to 39 if the first sub-identifier is 0 or 1. Finally, the ASN.1 standard requires that an object identifier has always at least two sub-identifiers. The pattern captures these restrictions.

Although the number of sub-identifiers is not limited, module designers should realize that there may be implementations that stick with the SMIV2 limit of 128 sub-identifiers.

This type is a superset of the SMIV2 OBJECT IDENTIFIER type since it is not restricted to 128 sub-identifiers. Hence, this type SHOULD NOT be used to represent the SMIV2 OBJECT IDENTIFIER type; the object-identifier-128 type SHOULD be used instead."

reference

"ISO 9834-1: Information technology -- Procedures for the operation of object identifier registration authorities -- Part 1: General procedures and top arcs of the international object identifier tree";

}

typedef object-identifier-128 {

type object-identifier {
pattern '[0-9]*(\.[0-9]*){1,127}';
}

description

"This type represents object-identifiers restricted to 128 sub-identifiers.

In the value set and its semantics, this type is equivalent to the OBJECT IDENTIFIER type of the SMIV2."

reference

"RFC 2578: Structure of Management Information Version 2 (SMIV2)";

}

/** collection of types related to date and time */

typedef date-and-time {

type string {
pattern
'[0-9]{4}-(1[0-2]|0[1-9])-(0[1-9]|1[1-2][0-9]|3[0-1])'
+ 'T(0[0-9]|1[0-9]|2[0-3]):[0-5][0-9]:([0-5][0-9]|60)'
+ '(\.[0-9]+)?'
+ '(Z|[\+|-]((1[0-3]|0[0-9]):([0-5][0-9]|14:00)))?';
}

description

"The date-and-time type is a profile of the ISO 8601 standard for representation of dates and times using the Gregorian calendar. The profile is defined by the date-time production in Section 5.6 of RFC 3339 and the update defined in Section 2 of RFC 9557. The value of 60 for seconds is allowed only in the case of leap seconds.

The date-and-time type is compatible with the dateTime XML schema dateTime type with the following notable exceptions:

- (a) The date-and-time type does not allow negative years.
- (b) The time-offset Z indicates that the date-and-time value is reported in UTC and that the local time zone reference point is unknown. The time-offset +00:00 indicates that the date-and-time value is reported in UTC and that the local time zone reference point is UTC (see Section 2 of RFC 9557).

This type is not equivalent to the DateAndTime textual convention of the SMIV2 since RFC 3339 uses a different separator between full-date and full-time and provides higher resolution of time-secfrac.

The canonical format for date-and-time values with a known time zone uses a numeric time zone offset that is calculated using the device's configured known offset to UTC time. A change of the device's offset to UTC time will cause

date-and-time values to change accordingly. Such changes might happen periodically if a server automatically follows daylight saving time (DST) time zone offset changes. The canonical format for date-and-time values reported in UTC with an unknown local time zone offset SHOULD use the time-offset Z and MAY use -00:00 for backwards compatibility.";

reference

"ISO 8601: Data elements and interchange formats -- Information interchange -- Representation of dates and times
RFC 3339: Date and Time on the Internet: Timestamps
RFC 9557: Date and Time on the Internet: Timestamps with Additional Information
RFC 2579: Textual Conventions for SMIV2
XSD-TYPES: XML Schema Definition Language (XSD) 1.1 Part 2: Datatypes";

}

typedef date {

type string {

pattern '[0-9]{4}-(1[0-2]|0[1-9])-(0[1-9]|[1-2][0-9]|3[0-1])' + '(Z|[\+\-]((1[0-3]|0[0-9]):([0-5][0-9])|14:00))?';

}

description

"The date type represents a time-interval of the length of a day, i.e., 24 hours. It includes an optional time zone offset.

The date type is compatible with the XML schema date type with the following notable exceptions:

- (a) The date type does not allow negative years.
- (b) The time-offset Z indicates that the date value is reported in UTC and that the local time zone reference point is unknown. The time-offset +00:00 indicates that the date value is reported in UTC and that the local time zone reference point is UTC (see Section 2 of RFC 9557).

The canonical format for date values with a known time zone uses a numeric time zone offset that is calculated using the device's configured known offset to UTC time. A change of the device's offset to UTC time will cause date values to change accordingly. Such changes might happen periodically if a server automatically follows daylight saving time (DST) time zone offset changes. The canonical format for date values reported in UTC with an unknown local time zone offset uses the time-offset Z.";

reference

"RFC 3339: Date and Time on the Internet: Timestamps
RFC 9557: Date and Time on the Internet: Timestamps with Additional Information
XSD-TYPES: XML Schema Definition Language (XSD) 1.1 Part 2: Datatypes";

}

typedef date-no-zone {

type date {

pattern '[0-9]{4}-(1[0-2]|0[1-9])-(0[1-9]|[1-2][0-9]|3[0-1])';

}

description

"The date-no-zone type represents a date without the optional time zone offset information.";

}

```

typedef time {
  type string {
    pattern
      '(0[0-9]|1[0-9]|2[0-3]):[0-5][0-9]:([0-5][0-9]|60)'
      + '(\.[0-9]+)?'
      + '(Z|[\+\-]((1[0-3]|0[0-9]):([0-5][0-9])|14:00))?';
  }
  description
    "The time type represents an instance of time of zero duration
    that recurs every day. It includes an optional time zone
    offset. The value of 60 for seconds is allowed only in the
    case of leap seconds.

    The time type is compatible with the XML schema time
    type with the following notable exception:

    (a) The time-offset Z indicates that the time value is
    reported in UTC and that the local time zone reference
    point is unknown. The time-offset +00:00 indicates that
    the time value is reported in UTC and that the local
    time zone reference point is UTC (see Section 2 of
    RFC 9557).

    The canonical format for time values with a known time
    zone uses a numeric time zone offset that is calculated using
    the device's configured known offset to UTC time. A change of
    the device's offset to UTC time will cause time values
    to change accordingly. Such changes might happen periodically
    if a server automatically follows daylight saving time
    (DST) time zone offset changes. The canonical format for
    time values reported in UTC with an unknown local time zone
    offset uses the time-offset Z.";
  reference
    "RFC 3339: Date and Time on the Internet: Timestamps
    RFC 9557: Date and Time on the Internet: Timestamps
    with Additional Information
    XSD-TYPES: XML Schema Definition Language (XSD) 1.1
    Part 2: Datatypes";
}

typedef time-no-zone {
  type time {
    pattern
      '(0[0-9]|1[0-9]|2[0-3]):[0-5][0-9]:([0-5][0-9]|60)'
      + '(\.[0-9]+)?';
  }
  description
    "The time-no-zone type represents a time without the optional
    time zone offset information.";
}

typedef hours32 {
  type int32;
  units "hours";
  description
    "A period of time measured in units of hours.

    The maximum time period that can be expressed is in the
    range [-89478485 days 08:00:00 to 89478485 days 07:00:00].

    This type should be range-restricted in situations
    where only non-negative time periods are desirable
    (i.e., range '0..max').";
}

typedef minutes32 {

```

```

type int32;
units "minutes";
description
    "A period of time measured in units of minutes.

    The maximum time period that can be expressed is in the
    range [-1491308 days 2:08:00 to 1491308 days 2:07:00].

    This type should be range-restricted in situations
    where only non-negative time periods are desirable
    (i.e., range '0..max').";
}

typedef seconds32 {
    type int32;
    units "seconds";
    description
        "A period of time measured in units of seconds.

        The maximum time period that can be expressed is in the
        range [-24855 days 03:14:08 to 24855 days 03:14:07].

        This type should be range-restricted in situations
        where only non-negative time periods are desirable
        (i.e., range '0..max').";
}

typedef centiseconds32 {
    type int32;
    units "centiseconds";
    description
        "A period of time measured in units of 10-2 seconds.

        The maximum time period that can be expressed is in the
        range [-248 days 13:13:56 to 248 days 13:13:56].

        This type should be range-restricted in situations
        where only non-negative time periods are desirable
        (i.e., range '0..max').";
}

typedef milliseconds32 {
    type int32;
    units "milliseconds";
    description
        "A period of time measured in units of 10-3 seconds.

        The maximum time period that can be expressed is in the
        range [-24 days 20:31:23 to 24 days 20:31:23].

        This type should be range-restricted in situations
        where only non-negative time periods are desirable
        (i.e., range '0..max').";
}

typedef microseconds32 {
    type int32;
    units "microseconds";
    description
        "A period of time measured in units of 10-6 seconds.

        The maximum time period that can be expressed is in the
        range [-00:35:47 to 00:35:47].

        This type should be range-restricted in situations
        where only non-negative time periods are desirable

```

```

        (i.e., range '0..max').";
    }

typedef microseconds64 {
    type int64;
    units "microseconds";
    description
        "A period of time measured in units of 10-6 seconds.

        The maximum time period that can be expressed is in the
        range [-106751991 days 04:00:54 to 106751991 days 04:00:54].

        This type should be range-restricted in situations
        where only non-negative time periods are desirable
        (i.e., range '0..max').";
}

typedef nanoseconds32 {
    type int32;
    units "nanoseconds";
    description
        "A period of time measured in units of 10-9 seconds.

        The maximum time period that can be expressed is in the
        range [-00:00:02 to 00:00:02].

        This type should be range-restricted in situations
        where only non-negative time periods are desirable
        (i.e., range '0..max').";
}

typedef nanoseconds64 {
    type int64;
    units "nanoseconds";
    description
        "A period of time measured in units of 10-9 seconds.

        The maximum time period that can be expressed is in the
        range [-106753 days 23:12:44 to 106752 days 0:47:16].

        This type should be range-restricted in situations
        where only non-negative time periods are desirable
        (i.e., range '0..max').";
}

typedef timeticks {
    type uint32;
    description
        "The timeticks type represents a non-negative integer that
        represents the time, modulo 232 (4294967296 decimal), in
        hundredths of a second between two epochs. When a schema
        node is defined that uses this type, the description of
        the schema node identifies both of the reference epochs.

        In the value set and its semantics, this type is equivalent
        to the TimeTicks type of the SMIV2.";
    reference
        "RFC 2578: Structure of Management Information Version 2
        (SMIV2)";
}

typedef timestamp {
    type timeticks;
    description
        "The timestamp type represents the value of an associated
        timeticks schema node instance at which a specific occurrence

```

happened. The specific occurrence must be defined in the description of any schema node defined using this type. When the specific occurrence occurred prior to the last time the associated timeticks schema node instance was zero, then the timestamp value is zero.

Note that this requires all timestamp values to be reset to zero when the value of the associated timeticks schema node instance reaches 497+ days and wraps around to zero.

The associated timeticks schema node must be specified in the description of any schema node using this type.

In the value set and its semantics, this type is equivalent to the TimeStamp textual convention of the SMIV2.";

reference

"RFC 2579: Textual Conventions for SMIV2";

}

/** collection of generic address types */

typedef phys-address {

type string {

pattern '([0-9a-fA-F]{2}(:[0-9a-fA-F]{2})*)?';

}

description

"Represents media- or physical-level addresses represented as a sequence of octets, each octet represented by two hexadecimal numbers. Octets are separated by colons. The canonical representation uses lowercase characters.

In the value set and its semantics, this type is equivalent to the PhysAddress textual convention of the SMIV2.";

reference

"RFC 2579: Textual Conventions for SMIV2";

}

typedef mac-address {

type string {

pattern '[0-9a-fA-F]{2}(:[0-9a-fA-F]{2}){5}';

}

description

"The mac-address type represents a 48-bit IEEE 802 Media Access Control (MAC) address. The canonical representation uses lowercase characters. Note that there are IEEE 802 MAC addresses with a different length that this type cannot represent. The phys-address type may be used to represent physical addresses of varying length.

In the value set and its semantics, this type is equivalent to the MacAddress textual convention of the SMIV2.";

reference

"IEEE 802: IEEE Standard for Local and Metropolitan Area Networks: Overview and Architecture
RFC 2579: Textual Conventions for SMIV2";

}

/** collection of XML-specific types */

typedef xpath1.0 {

type string;

description

"This type represents an XPATH 1.0 expression.

When a schema node is defined that uses this type, the description of the schema node MUST specify the XPath

```

        context in which the XPath expression is evaluated.";
reference
    "XPath: XML Path Language (XPath) Version 1.0";
}

/*** collection of string types ***/

typedef hex-string {
    type string {
        pattern '([0-9a-fA-F]{2}(:[0-9a-fA-F]{2})*)?';
    }
    description
        "A hexadecimal string with octets represented as hex digits
        separated by colons. The canonical representation uses
        lowercase characters.";
}

typedef uuid {
    type string {
        pattern '[0-9a-fA-F]{8}-[0-9a-fA-F]{4}-[0-9a-fA-F]{4}-'
            + '[0-9a-fA-F]{4}-[0-9a-fA-F]{12}';
    }
    description
        "A Universally Unique Identifier in the string representation
        defined in RFC 9562. The canonical representation uses
        lowercase characters.

        The following is an example of a UUID in string
        representation:
        f81d4fae-7dec-11d0-a765-00a0c91e6bf6.
        ";
    reference
        "RFC 9562: Universally Unique Identifiers (UUIDs)";
}

typedef dotted-quad {
    type string {
        pattern
            '(([0-9]|[1-9][0-9]|1[0-9][0-9]|2[0-4][0-9]|25[0-5])\.){3}'
            + '([0-9]|[1-9][0-9]|1[0-9][0-9]|2[0-4][0-9]|25[0-5])';
    }
    description
        "An unsigned 32-bit number expressed in the dotted-quad
        notation, i.e., four octets written as decimal numbers
        and separated with the '.' (full stop) character.";
}

typedef language-tag {
    type string;
    description
        "A language tag according to RFC 5646 (BCP 47). The
        canonical representation uses lowercase characters.

        Values of this type must be well-formed language tags,
        in conformance with the definition of well-formed tags
        in BCP 47. Implementations MAY further limit the values
        they accept to those permitted by a 'validating'
        processor, as defined in BCP 47.

        The canonical representation of values of this type is
        aligned with the SMIV2 LangTag textual convention for
        language tags fitting the length constraints imposed
        by the LangTag textual convention.";
    reference
        "RFC 5646: Tags for Identifying Languages
        RFC 5131: A MIB Textual Convention for Language Tags";
}

```



```

}

/** collection of YANG-specific types */

typedef yang-identifier {
  type string {
    length "1..max";
    pattern '[a-zA-Z_][a-zA-Z0-9\-\_\.]*';
  }
  description
    "A YANG identifier string as defined by the 'identifier'
    rule in Section 14 of RFC 7950. An identifier must
    start with an alphabetic character or an underscore
    followed by an arbitrary sequence of alphabetic or
    numeric characters, underscores, hyphens, or dots.

    This definition conforms to YANG 1.1 defined in RFC
    7950. In RFC 6991, this definition excluded
    all identifiers starting with any possible combination
    of the lowercase or uppercase character sequence 'xml',
    as required by YANG 1 defined in RFC 6020. If this type
    is used in a YANG 1 context, then this restriction still
    applies.";
  reference
    "RFC 7950: The YANG 1.1 Data Modeling Language
    RFC 6991: Common YANG Data Types
    RFC 6020: YANG - A Data Modeling Language for the
    Network Configuration Protocol (NETCONF)";
}
}
<CODE ENDS>

```

4. Internet Protocol Suite Types

The "ietf-inet-types" YANG module references [RFC0768], [RFC0791], [RFC0952], [RFC1034], [RFC1123], [RFC1930], [RFC2317], [RFC2474], [RFC2780], [RFC2782], [RFC3289], [RFC3305], [RFC3595], [RFC3927], [RFC3986], [RFC4001], [RFC4007], [RFC4271], [RFC4291], [RFC4340], [RFC4592], [RFC5017], [RFC5322], [RFC5890], [RFC5952], [RFC6532], [RFC6793], [RFC8200], [RFC9260], [RFC9293], and [RFC9499].

```

<CODE BEGINS> file "ietf-inet-types@2025-12-22.yang"
module ietf-inet-types {
  namespace "urn:ietf:params:xml:ns:yang:ietf-inet-types";
  prefix inet;

  organization
    "IETF Network Modeling (NETMOD) Working Group";
  contact
    "WG Web:    <https://datatracker.ietf.org/wg/netmod/>
    WG List:    <mailto:netmod@ietf.org>

    Editor:     Jrgen Schnwlder
                <mailto:jschoenwaelder@constructor.university>";
  description
    "This module contains a collection of generally useful derived
    YANG data types for Internet addresses and related things.

    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 (RFC 2119) (RFC 8174) when, and only when,
    they appear in all capitals, as shown here.

```

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This version of this YANG module is part of RFC 9911; see the RFC itself for full legal notices.";

```
revision 2025-12-22 {
  description
    "This revision adds the following new data types:
    - inet:ip-address-and-prefix
    - inet:ipv4-address-and-prefix
    - inet:ipv6-address-and-prefix
    - inet:protocol-number
    - inet:upper-layer-protocol-number
    - inet:host-name
    - inet:email-address
    - inet:ip-address-link-local
    - inet:ipv4-address-link-local
    - inet:ipv6-address-link-local
    The inet:host union was changed to use inet:host-name instead
    of inet:domain-name. Several pattern statements have been
    improved.";
  reference
    "RFC 9911: Common YANG Data Types";
}
revision 2013-07-15 {
  description
    "This revision adds the following new data types:
    - inet:ip-address-no-zone
    - inet:ipv4-address-no-zone
    - inet:ipv6-address-no-zone";
  reference
    "RFC 6991: Common YANG Data Types";
}
revision 2010-09-24 {
  description
    "Initial revision.";
  reference
    "RFC 6021: Common YANG Data Types";
}

/*** collection of types related to protocol fields ***/

typedef ip-version {
  type enumeration {
    enum unknown {
      value 0;
      description
        "An unknown or unspecified version of the Internet
        Protocol.";
    }
    enum ipv4 {
      value 1;
      description
        "The IPv4 protocol as defined in RFC 791.";
    }
    enum ipv6 {
      value 2;
      description
        "The IPv6 protocol as defined in RFC 8200.";
    }
  }
}
```

```

    }
    description
        "This value represents the version of the Internet Protocol.

        In the value set and its semantics, this type is equivalent
        to the InetVersion textual convention of the SMIV2.";
    reference
        "RFC 791: Internet Protocol
        RFC 8200: Internet Protocol, Version 6 (IPv6) Specification
        RFC 4001: Textual Conventions for Internet Network Addresses";
}

typedef dscp {
    type uint8 {
        range "0..63";
    }
    description
        "The dscp type represents a Differentiated Services Code Point
        that may be used for marking packets in a traffic stream.

        In the value set and its semantics, this type is equivalent
        to the Dscp textual convention of the SMIV2.";
    reference
        "RFC 3289: Management Information Base for the Differentiated
        Services Architecture
        RFC 2474: Definition of the Differentiated Services Field
        (DS Field) in the IPv4 and IPv6 Headers
        RFC 2780: IANA Allocation Guidelines For Values In
        the Internet Protocol and Related Headers";
}

typedef ipv6-flow-label {
    type uint32 {
        range "0..1048575";
    }
    description
        "The ipv6-flow-label type represents the flow identifier or
        Flow Label in an IPv6 packet header that may be used to
        discriminate traffic flows.

        In the value set and its semantics, this type is equivalent
        to the IPV6FlowLabel textual convention of the SMIV2.";
    reference
        "RFC 3595: Textual Conventions for IPv6 Flow Label
        RFC 8200: Internet Protocol, Version 6 (IPv6) Specification";
}

typedef port-number {
    type uint16 {
        range "0..65535";
    }
    description
        "The port-number type represents a 16-bit port number of an
        Internet transport-layer protocol such as UDP, TCP, DCCP, or
        SCTP.

        Port numbers are assigned by IANA. The current list of
        all assignments is available from <https://www.iana.org/>.

        Note that the port number value zero is reserved by IANA. In
        situations where the value zero does not make sense, it can
        be excluded by subtyping the port-number type.

        In the value set and its semantics, this type is equivalent
        to the InetPortNumber textual convention of the SMIV2.";
    reference

```

```

    "RFC 768: User Datagram Protocol
    RFC 9293: Transmission Control Protocol (TCP)
    RFC 9260: Stream Control Transmission Protocol
    RFC 4340: Datagram Congestion Control Protocol (DCCP)
    RFC 4001: Textual Conventions for Internet Network Addresses";
}

typedef protocol-number {
    type uint8;
    description
        "The protocol-number type represents an 8-bit Internet
        Protocol number, carried in the 'protocol' field of the
        IPv4 header or in the 'next header' field of the IPv6
        header.

        Protocol numbers are assigned by IANA. The current list of
        all assignments is available from <https://www.iana.org/>.";
    reference
        "RFC 791: Internet Protocol
        RFC 8200: Internet Protocol, Version 6 (IPv6) Specification";
}

typedef upper-layer-protocol-number {
    type protocol-number;
    description
        "The upper-layer-protocol-number represents the upper-layer
        protocol number carried in an IP packet. For IPv6 packets
        with extension headers, this is the protocol number carried
        in the last 'next header' field of the chain of IPv6 extension
        headers.";
    reference
        "RFC 791: Internet Protocol
        RFC 8200: Internet Protocol, Version 6 (IPv6) Specification";
}

/** collection of types related to autonomous systems */

typedef as-number {
    type uint32;
    description
        "The as-number type represents autonomous system numbers
        that identify an Autonomous System (AS). An AS is a set
        of routers under a single technical administration, using
        an interior gateway protocol and common metrics to route
        packets within the AS, and using an exterior gateway
        protocol to route packets to other ASes. IANA maintains
        the autonomous system number space and has delegated large
        parts to the regional registries.

        Autonomous system numbers were originally limited to 16
        bits. BGP extensions have enlarged the autonomous system
        number space to 32 bits. This type therefore uses an uint32
        base type without a range restriction in order to support
        a larger autonomous system number space.

        In the value set and its semantics, this type is equivalent
        to the InetAutonomousSystemNumber textual convention of
        the SMIV2.";
    reference
        "RFC 1930: Guidelines for creation, selection, and registration
        of an Autonomous System (AS)
        RFC 4271: A Border Gateway Protocol 4 (BGP-4)
        RFC 4001: Textual Conventions for Internet Network Addresses
        RFC 6793: BGP Support for Four-Octet Autonomous System (AS)
        Number Space";
}

```

```
/** collection of types related to IP addresses and hostnames */
```

```
typedef ip-address {
    type union {
        type ipv4-address;
        type ipv6-address;
    }
    description
        "The ip-address type represents an IP address and is IP
        version neutral. The format of the textual representation
        implies the IP version. This type supports scoped addresses
        by allowing zone identifiers in the address format.";
    reference
        "RFC 4007: IPv6 Scoped Address Architecture";
}
```

```
typedef ipv4-address {
    type string {
        pattern
            '([0-9]|[1-9][0-9]|1[0-9][0-9]|2[0-4][0-9]|25[0-5])\.([0-9]|'
            + '([0-9]|[1-9][0-9]|1[0-9][0-9]|2[0-4][0-9]|25[0-5]))'
            + '(%.+)?';
    }
    description
        "The ipv4-address type represents an IPv4 address in
        dotted-quad notation. The IPv4 address may include a zone
        index, separated by a % sign. If a system uses zone names
        that are not represented in UTF-8, then an implementation
        needs to use some mechanism to transform the local name
        into UTF-8. The definition of such a mechanism is outside
        the scope of this document.

        The zone index is used to disambiguate identical address
        values. For link-local addresses, the zone index will
        typically be the interface index number or the name of an
        interface. If the zone index is not present, the default
        zone of the device will be used.

        The canonical format for the zone index is the numerical
        format";
}
```

```
typedef ipv6-address {
    type string {
        pattern '(((:[0-9a-fA-F]{0,4}):)([0-9a-fA-F]{0,4}:){0,5}'
            + '((((:[0-9a-fA-F]{0,4}):)?(::[0-9a-fA-F]{0,4}))|'
            + '(((25[0-5]|2[0-4][0-9]|[01]?[0-9]?[0-9])\.){3}'
            + '(25[0-5]|2[0-4][0-9]|[01]?[0-9]?[0-9])))'
            + '(%[A-Za-z0-9][A-Za-z0-9\-\.~/*]?)?';
        pattern '(((^[^:]+:){6}(((^[^:]+:[^:]+)|(.[*\.\.])))|'
            + '((((^[^:]+:)*[^[^:]+)?::((^[^:]+:)*[^[^:]+)?)'
            + '(%.[*])?');
    }
}

description
    "The ipv6-address type represents an IPv6 address in full,
    mixed, shortened, and shortened-mixed notation. The IPv6
    address may include a zone index, separated by a % sign.
    If a system uses zone names that are not represented in
    UTF-8, then an implementation needs to use some mechanism
    to transform the local name into UTF-8. The definition of
    such a mechanism is outside the scope of this document.

    The zone index is used to disambiguate identical address
    values. For link-local addresses, the zone index will
    typically be the interface index number or the name of an
```

interface. If the zone index is not present, the default zone of the device will be used.

The canonical format of IPv6 addresses uses the textual representation defined in Section 4 of RFC 5952. The canonical format for the zone index is the numerical format as described in Section 11.2 of RFC 4007.";

reference

"RFC 4291: IP Version 6 Addressing Architecture
RFC 4007: IPv6 Scoped Address Architecture
RFC 5952: A Recommendation for IPv6 Address Text Representation";

}

typedef ip-address-no-zone {

type union {

type ipv4-address-no-zone;

type ipv6-address-no-zone;

}

description

"The ip-address-no-zone type represents an IP address and is IP version neutral. The format of the textual representation implies the IP version. This type does not support scoped addresses since it does not allow zone identifiers in the address format.";

reference

"RFC 4007: IPv6 Scoped Address Architecture";

}

typedef ipv4-address-no-zone {

type ipv4-address {

pattern '[0-9\\.]*';

}

description

"An IPv4 address without a zone index. This type, derived from the type ipv4-address, may be used in situations where the zone is known from the context and no zone index is needed.";

}

typedef ipv6-address-no-zone {

type ipv6-address {

pattern '[0-9a-fA-F:\\.]*';

}

description

"An IPv6 address without a zone index. This type, derived from the type ipv6-address, may be used in situations where the zone is known from the context and no zone index is needed.";

reference

"RFC 4291: IP Version 6 Addressing Architecture
RFC 4007: IPv6 Scoped Address Architecture
RFC 5952: A Recommendation for IPv6 Address Text Representation";

}

typedef ip-address-link-local {

type union {

type ipv4-address-link-local;

type ipv6-address-link-local;

}

description

"The ip-address-link-local type represents a link-local IP address and is IP version neutral. The format of the textual representation implies the IP version.";

}

```

typedef ipv4-address-link-local {
    type ipv4-address {
        pattern '169\.254\..*';
    }
    description
        "The ipv4-address-link-local type represents a link-local IPv4
        address in the prefix 169.254.0.0/16 as defined in Section 2.1
        of RFC 3927.";
    reference
        "RFC 3927: Dynamic Configuration of IPv4 Link-Local Addresses";
}

typedef ipv6-address-link-local {
    type ipv6-address {
        pattern '[fF][eE][89aAbB][0-9a-fA-F]:.*';
    }
    description
        "The ipv6-address-link-local type represents a link-local IPv6
        address in the prefix fe80::/10 as defined in Section 2.4 of
        RFC 4291.";
    reference
        "RFC 4291: IP Version 6 Addressing Architecture";
}

typedef ip-prefix {
    type union {
        type ipv4-prefix;
        type ipv6-prefix;
    }
    description
        "The ip-prefix type represents an IP prefix and is IP
        version neutral. The format of the textual representations
        implies the IP version.";
}

typedef ipv4-prefix {
    type string {
        pattern
            '([0-9]|[1-9][0-9]|1[0-9][0-9]|2[0-4][0-9]|25[0-5])\.([0-9]|'
            + '([0-9]|[1-9][0-9]|1[0-9][0-9]|2[0-4][0-9]|25[0-5]))'
            + '/((([0-9])|([1-2][0-9])|(3[0-2])))';
    }
    description
        "The ipv4-prefix type represents an IPv4 prefix.
        The prefix length is given by the number following the
        slash character and must be less than or equal to 32.

        A prefix length value of n corresponds to an IP address
        mask that has n contiguous 1-bits from the most
        significant bit (MSB) and all other bits set to 0.

        The canonical format of an IPv4 prefix has all bits of
        the IPv4 address set to zero that are not part of the
        IPv4 prefix.

        The definition of ipv4-prefix does not require that bits
        that are not part of the prefix be set to zero. However,
        implementations have to return values in canonical format,
        which requires non-prefix bits to be set to zero. This means
        that 192.0.2.1/24 must be accepted as a valid value, but it
        will be converted into the canonical format 192.0.2.0/24.";
}

typedef ipv6-prefix {
    type string {

```

```

pattern '((:[0-9a-fA-F]{0,4}):)([0-9a-fA-F]{0,4}:){0,5}'
+ '((( [0-9a-fA-F]{0,4})?:)([0-9a-fA-F]{0,4}))|'
+ '(((25[0-5]|2[0-4][0-9]|[01]?[0-9]?[0-9])\.){3}'
+ '(25[0-5]|2[0-4][0-9]|[01]?[0-9]?[0-9]))|'
+ '(/(( [0-9])|([0-9]{2})|(1[0-1][0-9])|(12[0-8])));'
pattern '((^[^:]+:){6}([^[^:]+:[^:]+)|(.*\..*))|'
+ '((( [^:]+:)*[^[^:]+)?::([^[^:]+:)*[^[^:]+)?)'
+ '(/.+)' ;
}
description
"The ipv6-prefix type represents an IPv6 prefix.
The prefix length is given by the number following the
slash character and must be less than or equal to 128.

A prefix length value of n corresponds to an IP address
mask that has n contiguous 1-bits from the most
significant bit (MSB) and all other bits set to 0.

The canonical format of an IPv6 prefix has all bits of
the IPv6 address set to zero that are not part of the
IPv6 prefix. Furthermore, the IPv6 address is represented
as defined in Section 4 of RFC 5952.

The definition of ipv6-prefix does not require that bits
that are not part of the prefix be set to zero. However,
implementations have to return values in canonical format,
which requires non-prefix bits to be set to zero. This means
that 2001:db8::1/64 must be accepted as a valid value, but it
will be converted into the canonical format 2001:db8::/64." ;
reference
"RFC 5952: A Recommendation for IPv6 Address Text
Representation";
}

typedef ip-address-and-prefix {
    type union {
        type ipv4-address-and-prefix;
        type ipv6-address-and-prefix;
    }
    description
    "The ip-address-and-prefix type represents an IP address and
    prefix and is IP version neutral. The format of the textual
    representations implies the IP version." ;
}

typedef ipv4-address-and-prefix {
    type string {
        pattern
        '(([0-9]|[1-9][0-9]|1[0-9][0-9]|2[0-4][0-9]|25[0-5])\.){3}'
        + '([0-9]|[1-9][0-9]|1[0-9][0-9]|2[0-4][0-9]|25[0-5])'
        + '/(( [0-9])|([1-2][0-9])|(3[0-2]))';
    }
    description
    "The ipv4-address-and-prefix type represents an IPv4
    address and an associated IPv4 prefix.
    The prefix length is given by the number following the
    slash character and must be less than or equal to 32.

    A prefix length value of n corresponds to an IP address
    mask that has n contiguous 1-bits from the most
    significant bit (MSB) and all other bits set to 0." ;
}

typedef ipv6-address-and-prefix {
    type string {
        pattern '((:[0-9a-fA-F]{0,4}):)([0-9a-fA-F]{0,4}:){0,5}'

```



```

+ '(((0-9a-fA-F){0,4}:)?(:|[0-9a-fA-F]{0,4}))|'
+ '(((25[0-5]|2[0-4][0-9]|[01]?[0-9]?[0-9])\.){3}'
+ '(25[0-5]|2[0-4][0-9]|[01]?[0-9]?[0-9]))'
+ '(/((0-9)|([0-9]{2})|([0-1][0-9])|([12][0-8])))';
pattern '([[:^:]]+){6}([[:^:]]+:[[:^:]]+)|(.*\..*)|'
+ '([[:^:]]+)*[[:^:]]+?::([[:^:]]+)*[[:^:]]+?'
+ '(/.+)';
}
description
"The ipv6-address-and-prefix type represents an IPv6
address and an associated IPv6 prefix.
The prefix length is given by the number following the
slash character and must be less than or equal to 128.

A prefix length value of n corresponds to an IP address
mask that has n contiguous 1-bits from the most
significant bit (MSB) and all other bits set to 0.

The canonical format requires that the IPv6 address is
represented as defined in Section 4 of RFC 5952.";
reference
"RFC 5952: A Recommendation for IPv6 Address Text
Representation";
}

/*** collection of domain name and URI types ***/

typedef domain-name {
type string {
length "1..253";
pattern
'((([a-zA-Z0-9_]([a-zA-Z0-9\_-])\{0,61\})?[a-zA-Z0-9]\.)*'
+ '([a-zA-Z0-9_]([a-zA-Z0-9\_-])\{0,61\})?[a-zA-Z0-9]\.?)'
+ '|\.';
}
description
"The domain-name type represents a DNS domain name. The
name SHOULD be fully qualified whenever possible. This
type does not support wildcards (see RFC 4592) or
classless in-addr.arpa delegations (see RFC 2317).

Internet domain names are only loosely specified. Section
3.5 of RFC 1034 recommends a syntax (modified in Section
2.1 of RFC 1123). The pattern above is intended to allow
for current practice in domain name use and some possible
future expansion. Note that Internet host names have a
stricter syntax (described in RFC 952) than the DNS
recommendations in RFCs 1034 and 1123. Schema nodes
representing host names should use the host-name type
instead of the domain-type.

The encoding of DNS names in the DNS protocol is limited
to 255 characters. Since the encoding consists of labels
prefixed by a length byte and there is a trailing NUL
byte, only 253 characters can appear in the textual dotted
notation.

The description clause of schema nodes using the domain-name
type MUST describe when and how these names are resolved to
IP addresses. Note that the resolution of a domain-name value
may require to query multiple DNS records (e.g., A for IPv4
and AAAA for IPv6). The order of the resolution process and
which DNS record takes precedence can either be defined
explicitly or depend on the configuration of the
resolver.
```

```

        Domain-name values use the ASCII encoding.  Their canonical
        format uses lowercase ASCII characters.  Internationalized
        domain names MUST be A-labels as per RFC 5890.";
reference
    "RFC 952: DoD Internet Host Table Specification
    RFC 1034: Domain Names - Concepts and Facilities
    RFC 1123: Requirements for Internet Hosts -- Application
        and Support
    RFC 2317: Classless IN-ADDR.ARPA delegation
    RFC 2782: A DNS RR for specifying the location of services
        (DNS SRV)
    RFC 4592: The Role of Wildcards in the Domain Name System
    RFC 5890: Internationalized Domain Names in Applications
        (IDNA): Definitions and Document Framework
    RFC 9499: DNS Terminology";
}

typedef host-name {
    type domain-name {
        length "2..max";
        pattern '[a-zA-Z0-9\-\.\.]+';
    }
    description
        "The host-name type represents fully qualified host names.
        Host names must be at least two characters long (see RFC 952),
        and they are restricted to labels consisting of letters,
        digits, and hyphens separated by dots (see RFCs 1123 and
        952).";
    reference
        "RFC 952: DoD Internet Host Table Specification
        RFC 1123: Requirements for Internet Hosts -- Application
            and Support";
}

typedef host {
    type union {
        type ip-address;
        type host-name;
    }
    description
        "The host type represents either an IP address or a fully
        qualified host name.";
}

typedef uri {
    type string {
        pattern '[a-z][a-z0-9+.-]*.*';
    }
    description
        "The uri type represents a Uniform Resource Identifier
        (URI) as defined by the rule 'URI' in RFC 3986.

        Objects using the uri type MUST be in ASCII encoding
        and MUST be normalized as described in Sections 6.2.1,
        6.2.2.1, and 6.2.2.2 of RFC 3986.  Characters that can be
        represented without using percent-encoding are represented
        as characters (without percent-encoding), and all
        case-insensitive characters are set to lowercase except
        for hexadecimal digits within a percent-encoded triplet,
        which are normalized to uppercase as described in
        Section 6.2.2.1 of RFC 3986.

        The purpose of this normalization is to help provide
        unique URIs.  Note that this normalization is not
        sufficient to provide uniqueness.  Two URIs that are
        textually distinct after this normalization may still be

```

equivalent.

Objects using the uri type may restrict the schemes that they permit. For example, 'data:' and 'urn:' schemes might not be appropriate.

A zero-length URI is not a valid URI. This can be used to express 'URI absent' where required.

In the value set and its semantics, this type is equivalent to the Uri SMIV2 textual convention defined in RFC 5017.";
reference

```
"RFC 3986: Uniform Resource Identifier (URI): Generic Syntax
RFC 3305: Report from the Joint W3C/IETF URI Planning Interest
          Group: Uniform Resource Identifiers (URIs), URLs,
          and Uniform Resource Names (URNs): Clarifications
          and Recommendations
RFC 5017: MIB Textual Conventions for Uniform Resource
          Identifiers (URIs)";
```

```
}
```

```
typedef email-address {
    type string {
        pattern '.*@.*';
    }
}
```

description

"The email-address type represents an internationalized email address.

The email address format is defined by the addr-spec ABNF rule in Section 3.4.1 of RFC 5322. This format has been extended by RFC 6532 to support internationalized email addresses. Implementations MUST support the internationalization extensions of RFC 6532. Support for the obsolete obs-local-part, obs-domain, and obs-qttext in RFC 5322 is not required.

The domain part may use both A-labels and U-labels (see RFC 5890). The canonical format of the domain part uses lowercase characters and U-labels (RFC 5890) where applicable.";

reference

```
"RFC 5322: Internet Message Format
RFC 5890: Internationalized Domain Names in Applications
          (IDNA): Definitions and Document Framework
RFC 6532: Internationalized Email Headers";
```

```
}
```

```
}
```

```
<CODE ENDS>
```

5. IANA Considerations

This document reuses the URIs for "ietf-yang-types" and "ietf-inet-types" in the "IETF XML Registry" [RFC3688].

Per this document, IANA has updated the "YANG Module Names" registry to reference this RFC instead of [RFC6991] for the "ietf-yang-types" and "ietf-inet-types" modules. Following the format in [RFC6020], these registrations have been made.

Name: ietf-yang-types

Namespace: urn:ietf:params:xml:ns:yang:ietf-yang-types

Prefix: yang

Reference: RFC 9911

Name: ietf-inet-types

Namespace: urn:ietf:params:xml:ns:yang:ietf-inet-types
Prefix: inet
Reference: RFC 9911

6. Security Considerations

This document defines common data types using the YANG data modeling language. The definitions themselves have no security impact on the Internet, but the usage of these definitions in concrete YANG modules might have. The security considerations spelled out in the YANG specification [RFC7950] apply for this document as well.

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