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October 23, 2009

Common YANG Data Types
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Internet-Draft

YANG-TYPES

October 2009

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Internet-Draft

YANG-TYPES

October 2009

Abstract

This document introduces a collection of common data types to be used with the YANG data modeling language.

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1. Introduction

YANG [[YANG](#)] is a data modeling language used to model configuration and state data manipulated by the NETCONF [[RFC4741](#)] protocol. 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 introduces a collection of common data types derived from the built-in YANG data types. The definitions are organized in several YANG modules. The "ietf-yang-types" module contains generally useful data types. The "ietf-inet-types" module contains definitions that are relevant for the Internet protocol suite.

The derived types are generally designed to be applicable for modeling all areas of management information.

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](#)].

[2.](#) Overview

This section provides a short overview over the types defined in subsequent sections and their equivalent SMIV2 data types. Table 1 list the types defined in the `ietf-yang-types` YANG module and the corresponding SMIV2 types (if any).

ietf-yang-types

YANG type	Equivalent SMIV2 type (module)
<code>counter32</code>	Counter32 (SNMPv2-SMI)
<code>zero-based-counter32</code>	ZeroBasedCounter32 (RMON2-MIB)
<code>counter64</code>	Counter64 (SNMPv2-SMI)
<code>zero-based-counter64</code>	ZeroBasedCounter64 (HCNUM-TC)
<code>gauge32</code>	Gauge32 (SNMPv2-SMI)
<code>gauge64</code>	CounterBasedGauge64 (HCNUM-TC)
<code>object-identifier</code>	-
<code>object-identifier-128</code>	OBJECT IDENTIFIER
<code>date-and-time</code>	-
<code>timeticks</code>	TimeTicks (SNMPv2-SMI)

timestamp	TimeStamp (SNMPv2-TC)	
phys-address	PhysAddress (SNMPv2-TC)	
mac-address	MacAddress (SNMPv2-TC)	
xpath1.0	-	
+-----+-----+-----+		

Table 1

Table 2 list the types defined in the ietf-inet-types YANG module and the corresponding SMIV2 types (if any).

ietf-inet-types

YANG type	Equivalent SMIV2 type (module)	
ip-version	-	
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)	
ip-address	-	
ipv4-address	-	
ipv6-address	-	
ip-prefix	-	
ipv4-prefix	-	

ipv6-prefix	-	
domain-name	-	
host	-	
uri	Uri (URI-TC-MIB)	
+-----+-----+-----+		

Table 2

[3.](#) Core YANG Derived Types

```
== begin "ietf-yang-types.yang"
```

```
module ietf-yang-types {
```

```
  namespace "urn:ietf:params:xml:ns:yang:ietf-yang-types-DRAFT-04";
  prefix "yang";
```

organization

"IETF NETMOD (NETCONF Data Modeling Language) Working Group";

contact

"WG Web: <<http://tools.ietf.org/wg/netmod/>>

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

WG Chair: David Partain

<<mailto:david.partain@ericsson.com>>

WG Chair: David Kessens

<<mailto:david.kessens@nsn.com>>

Editor: Juergen Schoenwaelder

<<mailto:j.schoenwaelder@jacobs-university.de>>;

description

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

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

// RFC Ed.: replace XXXX with actual RFC number and remove this note

// RFC Ed.: remove this note

// Note: extracted from [draft-ietf-netmod-yang-types-04.txt](#)

revision 2009-10-23 {

description

"Initial revision.";


```

reference
  "RFC XXXX: Common YANG Data Types";
}
// RFC Ed.: replace XXXX with actual RFC number and remove this note

/*** collection of counter and gauge types ***/

typedef counter32 {
  type uint32;
  description
    "The counter32 type represents a non-negative integer
    which 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 an object instance using this type. If
    such other times can occur, for example, the creation of
    an object instance of type counter32 at times other than
    re-initialization, then a corresponding object should be
    defined, with an appropriate type, to indicate the last
    discontinuity.

    The counter32 type should not be used for configuration
    objects. A default statement should not be used for
    attributes with a type value of counter32.

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

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

    Objects of this type will be set to zero(0) on creation
    and will thereafter count appropriate events, wrapping
    back to zero(0) when the value 2^32 is reached."

```

Provided that an application discovers the new object within the minimum time to wrap it can use the initial value as a delta since it last polled the table of which this object is part. 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.

This type is in the value set and its semantics equivalent to the ZeroBasedCounter32 textual convention of the SMIV2.";
reference

"[RFC 2021](#): Remote Network Monitoring Management Information Base Version 2 using SMIV2";

}

typedef counter64 {

type uint64;

description

"The counter64 type represents a non-negative integer which monotonically increases until it reaches a maximum value of $2^{64}-1$ (18446744073709551615), 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 an object instance using this type. If such other times can occur, for example, the creation of an object instance of type counter64 at times other than re-initialization, then a corresponding object should be defined, with an appropriate type, to indicate the last discontinuity.

The counter64 type should not be used for configuration objects. A default statement should not be used for attributes with a type value of counter64.

This type is in the value set and its semantics equivalent to the Counter64 type of the SMIV2.";
reference

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

}

typedef zero-based-counter64 {

```
type yang:counter64;  
default "0";
```

description

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

Objects of this type will be set to zero(0) on creation and will thereafter count appropriate events, wrapping back to zero(0) when the value 2^{64} is reached.

Provided that an application discovers the new object within the minimum time to wrap it can use the initial value as a delta since it last polled the table of which this object is part. 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.

This type is in the value set and its semantics 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 can not be greater than $2^{32}-1$ (4294967295 decimal), and the minimum value can not 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 (increases above) the maximum (minimum) value, the gauge32 also decreases (increases).

```

    This type is in the value set and its semantics equivalent
    to the Counter32 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
    can not be greater than 2^64-1 (18446744073709551615), and
    the minimum value can not 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).

    This type is in the value set and its semantics 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]\d*))))'
      + '(\.(0|([1-9]\d*)))+';
  }
  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 white space.

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.";

reference

"ISO/IEC 9834-1: Information technology -- Open Systems Interconnection -- Procedures for the operation of OSI

```
    Registration Authorities: General procedures and top
    arcs of the ASN.1 Object Identifier tree";
}

typedef object-identifier-128 {
    type object-identifier {
        pattern '\d*(.\d*){1,127}';
    }
    description
        "This type represents object-identifiers restricted to 128
        sub-identifiers.

        This type is in the value set and its semantics equivalent
        to the OBJECT IDENTIFIER type of the SMIV2.";
    reference
        "RFC 2578: Structure of Management Information Version 2 (SMIV2)";
}

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

typedef date-and-time {
    type string {
        pattern '\d{4}-\d{2}-\d{2}T\d{2}:\d{2}:\d{2}(\.\d+)?'
            + '(Z|(\+|-)\d{2}:\d{2})';
    }
}
```

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 format is most easily described using the following ABFN (see [RFC 3339](#)):

```
date-fullyear    = 4DIGIT
date-month       = 2DIGIT  ; 01-12
date-mday        = 2DIGIT  ; 01-28, 01-29, 01-30, 01-31
time-hour        = 2DIGIT  ; 00-23
time-minute      = 2DIGIT  ; 00-59
time-second      = 2DIGIT  ; 00-58, 00-59, 00-60
time-secfrac     = "." 1*DIGIT
time-numoffset   = ("+" / "-") time-hour ":" time-minute
time-offset      = "Z" / time-numoffset

partial-time     = time-hour ":" time-minute ":" time-second
                  [time-secfrac]
full-date        = date-fullyear "-" date-month "-" date-mday
full-time        = partial-time time-offset

date-time        = full-date "T" full-time
```

The date-and-time type is consistent with the semantics defined in [RFC 3339](#). The date-and-time type is compatible with the dateTime XML schema type with the following two notable exceptions:

- (a) The date-and-time type does not allow negative years.
- (b) The date-and-time time-offset -00:00 indicates an unknown time zone (see [RFC 3339](#)) while -00:00 and +00:00 and Z all represent the same time zone in dateTime.
- (c) The canonical format (see below) of data-and-time values differs from the canonical format used by the dateTime XML schema type, which requires all times to be in UTC using the time-offset "Z".

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 in case a server follows automatically daylight saving time (DST) time zone offset changes. The canonical format for date-and-time values with an unknown time zone (usually referring to the notion of local time) uses the time-offset '-00:00.';

reference

[RFC 3339](#): Date and Time on the Internet: Timestamps

[RFC 2579](#): Textual Conventions for SMIV2

W3C REC-xmlschema-2-20041028: XML Schema Part 2: Datatypes Second Edition";

}

typedef timeticks {

type uint32;

description

"The timeticks type represents a non-negative integer which represents the time, modulo 2^{32} (4294967296 decimal), in hundredths of a second between two epochs. When objects are defined which use this type, the description of the object identifies both of the reference epochs.

This type is in the value set and its semantics equivalent to the TimeTicks type of the SMIV2.";

reference

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

}

typedef timestamp {

type yang:timeticks;

description

"The timestamp type represents the value of an associated timeticks object at which a specific occurrence happened. The specific occurrence must be defined in the description of any object defined using this type. When the specific

occurrence occurred prior to the last time the associated timeticks attribute 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 attribute reaches 497+ days and wraps around to zero.

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

This type is in the value set and its semantics 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 '([0-9a0-fA-F]{2}(:[0-9a0-fA-F]{2})*)?';

}

description

"Represents media- or physical-level addresses represented as a sequence octets, each octet represented by two hexadecimal numbers. Octets are separated by colons.

This type is in the value set and its semantics 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 an IEEE 802 MAC address.

This type is in the value set and its semantics 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.";
  reference
    "W3C REC-xpath-19991116: XML Path Language (XPath) Version 1.0";
}

}

== end "ietf-yang-types.yang"
```

4. Internet Specific Derived Types

```
== begin "ietf-inet-types.yang"
```

```
module ietf-inet-types {
```

```
  namespace "urn:ietf:params:xml:ns:yang:ietf-inet-types-DRAFT-04";  
  prefix "inet";
```

```
  organization
```

```
    "IETF NETMOD (NETCONF Data Modeling Language) Working Group";
```

```
  contact
```

```
    "WG Web: <http://tools.ietf.org/wg/netmod/>
```

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

```
    WG Chair: David Partain
```

```
              <mailto:david.partain@ericsson.com>
```

```
    WG Chair: David Kessens
```

```
              <mailto:david.kessens@nsn.com>
```

```
    Editor: Juergen Schoenwaelder
```

```
            <mailto:j.schoenwaelder@jacobs-university.de>;
```

```
  description
```

```
    "This module contains a collection of generally useful derived  
    YANG data types for Internet addresses and related things.
```

```
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```

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    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.";
```

```
// RFC Ed.: replace XXXX with actual RFC number and remove this note
```

```
// RFC Ed.: remove this note
```

```
// Note: extracted from draft-ietf-netmod-yang-types-04.txt
```

```
  revision 2009-10-23 {
```

description

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YANG-TYPES

October 2009

```
    "Initial revision.";
  reference
    "RFC XXXX: Common YANG Data Types";
}
// RFC Ed.: replace XXXX with actual RFC number and remove this note

/** collection of protocol field related types */

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 2460.";
    }
  }
  description
    "This value represents the version of the IP protocol.

    This type is in the value set and its semantics equivalent
    to the InetVersion textual convention of the SMIV2. However,
    the lexical appearance is different from the InetVersion
    textual convention.";
  reference
    "RFC 791: Internet Protocol
    RFC 2460: 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.

    This type is in the value set and its semantics 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 flow-label type represents flow identifier or Flow Label
        in an IPv6 packet header that may be used to discriminate
        traffic flows.

        This type is in the value set and its semantics equivalent
        to the IPv6FlowLabel textual convention of the SMIV2.";
reference
    "RFC 3595: Textual Conventions for IPv6 Flow Label
    RFC 2460: Internet Protocol, Version 6 (IPv6) Specification";
}

typedef port-number {
    type uint16 {
        range "1..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. A current list of all assignments is available from <<http://www.iana.org/>>.

Note that the value zero is not a valid port number. A union type might be used in situations where the value zero is meaningful.

This type is in the value set and its semantics equivalent to the InetPortNumber textual convention of the SMIV2.";
reference

"RFC 768: User Datagram Protocol
RFC 793: Transmission Control Protocol
[RFC 2960](#): Stream Control Transmission Protocol
[RFC 4340](#): Datagram Congestion Control Protocol (DCCP)
[RFC 4001](#): Textual Conventions for Internet Network Addresses";

}

/** collection of autonomous system related types **/

typedef as-number {

 type uint32;

 description

 "The as-number type represents autonomous system numbers which 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 ASs'. IANA maintains the AS 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.

 This type is in the value set and its semantics 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 4893: BGP Support for Four-octet AS Number Space
    "RFC 4001: Textual Conventions for Internet Network Addresses";
}

/*** collection of IP address and hostname related types ***/

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

typedef ipv4-address {
  type string {

```

```

  pattern '((0'
    + '|(1[0-9]{0,2})'|
    + '|(2((([0-4][0-9]?)|(5[0-5]?)|([6-9]?)))'|
    + '|([3-9][0-9]?)'|
    + ')'|
    + '\.){3}'
    + '(0'
    + '|(1[0-9]{0,2})'|
    + '|(2((([0-4][0-9]?)|(5[0-5]?)|([6-9]?)))'|
    + '|([3-9][0-9]?)'|
    + '))(%[\p{N}\p{L}]+)?';
}
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.

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])))'
      + '(%[\p{N}\p{L}]*)?';
    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.

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 compressed format described in [RFC 4291 section 2.2](#) item 2 with the following additional rules: The :: substitution must be applied to the longest sequence of all-zero 16-bit chunks in an IPv6 address. If there is a tie, the first sequence of all-zero 16-bit chunks is replaced by ::. Single all-zero 16-bit chunks are not compressed. The normalized format uses lower-case characters and leading zeros are not allowed. The canonical format for the zone index is the numerical format as described in [RFC 4007 section 11.2](#).";

reference

```

    "RFC 4291: IP Version 6 Addressing Architecture
    RFC 4007: IPv6 Scoped Address Architecture";
}

typedef ip-prefix {
    type union {
        type inet:ipv4-prefix;
        type inet: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 '((([0-1]?[0-9]?[0-9]|2[0-4][0-9]|25[0-5])\.){3}'
            + '([0-1]?[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 address 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 which 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.";
}

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 address prefix.
    The prefix length is given by the number following the
    slash character and must be less than or equal 128.

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

    The IPv6 address should have all bits that do not belong
    to the prefix set to zero.

    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, IPv6 address is represented
    in the compressed format described in RFC 4291 section 2.2
    item 2 with the following additional rules: The ::
    substitution must be applied to the longest sequence of
    all-zero 16-bit chunks in an IPv6 address. If there is
    a tie, the first sequence of all-zero 16-bit chunks is
    replaced by ::. Single all-zero 16-bit chunks are not
    compressed. The normalized format uses lower-case
    characters and leading zeros are not allowed.";
reference
    "RFC 4291: IP Version 6 Addressing Architecture";
}

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

typedef domain-name {
    type string {
        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]\.?)'
            + '|\.?';
        length "1..253";
    }
description
    "The domain-name type represents a DNS domain name. The

```

name SHOULD be fully qualified whenever possible.

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 practise in domain name use, and some possible future expansion. It is designed to hold various types of domain names, including names used for A or AAAA records (host names) and other records, such as SRV records. Note that Internet host names have a stricter syntax (described in [RFC 952](#)) than the DNS recommendations in RFCs 1034 and 1123, and that systems that want to store host names in objects using the domain-name type are recommended to adhere to this stricter standard to ensure interoperability.

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

The description clause of objects using the domain-name type MUST describe how (and when) 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 depends on the configuration of the resolver.

The canonical format for domain-name values uses the US-ASCII encoding and case-insensitive characters are set to lowercase.";

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 3490: Internationalizing Domain Names in Applications
(IDNA)";
```

```
}
```

```
typedef host {
    type union {
        type inet:ip-address;
        type inet:domain-name;
    }
}
```

description

```
"The host type represents either an IP address or a DNS
```

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```
    domain name.";  
}
```

```
typedef uri {  
    type string;  
    description  
    "The uri type represents a Uniform Resource Identifier  
    (URI) as defined by STD 66.
```

Objects using the uri type must be in US-ASCII encoding, and MUST be normalized as described by [RFC 3986](#) Sections 6.2.1, 6.2.2.1, and 6.2.2.2. All unnecessary percent-encoding is removed, and all case-insensitive characters are set to lowercase except for hexadecimal digits, which are normalized to uppercase as described in [Section 6.2.2.1](#).

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

This type is in the value set and its semantics 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)";
```

```
}
```

```
}  
  
== end "ietf-inet-types.yang"
```

5. IANA Considerations

This document registers two URIs in the IETF XML registry [[RFC3688](#)]. Following the format in [RFC 3688](#), the following registration is requested.

URI: urn:ietf:params:xml:ns:yang:ietf-yang-types
URI: urn:ietf:params:xml:ns:yang:ietf-inet-types

Registrant Contact: The NETMOD WG of the IETF.

XML: N/A, the requested URI is an XML namespace.

This document registers two YANG modules in the YANG Module Names registry [[YANG](#)].

name: ietf-yang-types
namespace: urn:ietf:params:xml:ns:yang:ietf-yang-types
prefix: yang
reference: RFCXXXX

name: ietf-inet-types
namespace: urn:ietf:params:xml:ns:yang:ietf-inet-types
prefix: inet
reference: RFCXXXX

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 [[YANG](#)] apply for this document as well.

[7.](#) Contributors

The following people contributed significantly to the initial version of this draft:

- Andy Bierman (Netconf Central)
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[8.](#) Acknowledgments

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