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Common YANG Data Types
draft-ietf-netmod-yang-types-06

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

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YANG [YANG] (Bjorklund, M., Ed., “YANG - A data modeling language for NETCONF,” .) is a data modeling language used to model configuration and state data manipulated by the NETCONF [RFC4741] (Enns, R., “NETCONF Configuration Protocol,” December 2006.) 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] (Bradner, S., “Key words for use in RFCs to Indicate Requirement Levels,” March 1997.).

2. Overview

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This section provides a short overview over the types defined in subsequent sections and their equivalent SMIv2 data types. 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 1 lists 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)
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	-
object-identifier-128	OBJECT IDENTIFIER
date-and-time	-
timeticks	TimeTicks (SNMPv2-SMI)
timestamp	TimeStamp (SNMPv2-TC)
phys-address	PhysAddress (SNMPv2-TC)
mac-address	MacAddress (SNMPv2-TC)
xpath1.0	-

Table 1

Table 2 lists 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	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)
ip-address	-
ipv4-address	-
ipv6-address	-
ip-prefix	-
ipv4-prefix	-
ipv6-prefix	-
domain-name	-
host	-
uri	Uri (URI-TC-MIB)

Table 2

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3. Core YANG Derived Types

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<CODE BEGINS> file "ietf-yang-types@2010-02-03.yang"

```
module ietf-yang-types {

  namespace "urn:ietf:params:xml:ns:yang:ietf-yang-types-DRAFT-06";
  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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    the document authors.  All rights reserved.

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

    This version of this YANG module is part of RFC XXXX; see
    the RFC itself for full legal notices.";
  // 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-05.txt

  revision 2010-02-03 {
    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 a schema node using this type.  If such
    other times can occur, for example, the creation of an
    a schema node of type counter32 at times other than
    re-initialization, 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 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.

    Schema nodes of 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 schema node
    of 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.

    This type is in the value set and its semantics equivalent
    to the ZeroBasedCounter32 textual convention of the SMIv2.";
  reference
    "RFC 4502: 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 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 such
    other times can occur, for example, the creation of
    a schema node of type counter64 at times other than
    re-initialization, 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 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.

    Schema nodes of 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 schema node
    of 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.

    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
    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 (increases above) the maximum (minimum) value, the
    gauge32 also decreases (increases).

    This type is in the value set and its semantics 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).

    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 (replacing double quotes with
    single quotes):

    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 refering
    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 a schema
    node is defined which uses this type, the description of
    the schema node 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 schema node 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 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 schema node must be specified
    in the description of any schema node 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 '([0-9a-fA-F]{2}(:[0-9a-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. The canonical
    representation uses lower-case characters.

    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.
    The canonical representation uses lower-case characters.

    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.

          When a schema node is defined which uses this type, the
          description of the schema node MUST specify the XPath
          context in which the XPath expression is evaluated.";
        reference
         "W3C REC-xpath-19991116: XML Path Language (XPath) Version 1.0";
      }

    }

<CODE ENDS>
```

---

4. Internet Specific Derived Types

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```
<CODE BEGINS> file "ietf-inet-types@2010-02-03.yang"
```

```
module ietf-inet-types {

  namespace "urn:ietf:params:xml:ns:yang:ietf-inet-types-DRAFT-06";
  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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    the document authors.  All rights reserved.

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

    This version of this YANG module is part of RFC XXXX; see
    the RFC itself for full legal notices.";
  // 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-05.txt

  revision 2010-02-03 {
    description
     "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.";
  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 4960: 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]?[0-9]|2[0-4][0-9]|25[0-5])\.){3}'
          + '([0-1]?[0-9]?[0-9]|2[0-4][0-9]|25[0-5])'
          + '(%[\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 canonical
    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
    IDv6TREP: A Recommendation for IPv6 Address Text Representation";
}

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 canonical 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
    schema nodes 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 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
    explicitely or it may depend 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
    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)";
      }

    }

<CODE ENDS>
```

---

5. IANA Considerations

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This document registers two URIs in the IETF XML registry [RFC3688] (Mealling, M., “The IETF XML Registry,” January 2004.). 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] (Bjorklund, M., Ed., “YANG - A data modeling language for NETCONF,” .).

```
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

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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] (Bjorklund, M., Ed., "YANG - A data modeling language for NETCONF," .) apply for this document as well.

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7. Contributors

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

- Andy Bierman (Netconf Central)
- Martin Bjorklund (Tail-f Systems)
- Balazs Lengyel (Ericsson)
- David Partain (Ericsson)
- Phil Shafer (Juniper Networks)

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8. Acknowledgments

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9. References

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