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January 2,

2004

**Textual Conventions for Internet Network Addresses**  
**draft-ietf-ops-rfc3291bis-03.txt**

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Abstract

This MIB module defines textual conventions to represent commonly used Internet network layer addressing information. The intent is that these textual conventions will be imported and used in MIB

modules that would otherwise define their own representations.

This document obsoletes [RFC 3291](#).

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## 1. Introduction

Several standard-track MIB modules use the IpAddress SMIV2 base type.

This limits the applicability of these MIB modules to IP Version 4 (IPv4) since the IpAddress SMIV2 base type can only contain 4 byte IPv4 addresses. The IpAddress SMIV2 base type has become problematic with the introduction of IP Version 6 (IPv6) addresses [[RFC3513](#)].

This document defines multiple textual conventions (TCs) as a mechanism to express generic Internet network layer addresses within MIB module specifications. The solution is compatible with SMIV2 (STD

58) and SMIV1 (STD 16). New MIB definitions which need to express network layer Internet addresses SHOULD use the textual conventions defined in this memo. New MIB modules SHOULD NOT use the SMIV2 IpAddress base type anymore.

A generic Internet address consists of two objects, one whose syntax is InetAddressType, and another whose syntax is InetAddress. The value of the first object determines how the value of the second object is encoded. The InetAddress textual convention represents an opaque Internet address value. The InetAddressType enumeration is used to "cast" the InetAddress value into a concrete textual convention for the address type. This usage of multiple textual conventions allows expression of the display characteristics of each address type and makes the set of defined Internet address types extensible.

The textual conventions for well-known transport domains support scoped Internet addresses. The scope of an Internet address is a topological span within which the address may be used as a unique identifier for an interface or set of interfaces. A scope zone, or simply a zone, is a concrete connected region of topology of a given scope. Note that a zone is a particular instance of a topological region, whereas a scope is the size of a topological region [[RFCZZZZ](#)]. Since Internet addresses on devices that connect multiple

zones are not necessarily unique, an additional zone index is needed on these devices to select an interface. The textual conventions InetAddressIPv4z and InetAddressIPv6z are provided to support Internet addresses that include a zone index. In order to support arbitrary combinations of scoped Internet addresses, MIB authors SHOULD use a separate InetAddressType object for each InetAddress object.

The textual conventions defined in this document can also be used to represent generic Internet subnets and Internet address ranges. A generic Internet subnet is represented by three objects, one whose syntax is InetAddressType, a second one whose syntax is InetAddress and a third one whose syntax is InetAddressPrefixLength. The



InetAddressType value again determines the concrete format of the InetAddress value while the InetAddressPrefixLength identifies the Internet network address prefix.

A generic range of consecutive Internet addresses is represented by three objects. The first one has the syntax InetAddressType while the remaining objects have the syntax InetAddress and specify the start and end of the address range. The InetAddressType value again determines the format of the InetAddress values.

The textual conventions defined in this document can be used to define Internet addresses by using DNS domain names in addition to IPv4 and IPv6 addresses. A MIB designer can write compliance statements to express that only a subset of the possible address types must be supported by a compliant implementation.

MIB developers who need to represent Internet addresses SHOULD use these definitions whenever applicable, as opposed to defining their own constructs. Even MIB modules that only need to represent IPv4 or IPv6 addresses SHOULD use the InetAddressType/InetAddress textual conventions defined in this memo.

There are many widely deployed MIB modules that use IPv4 addresses and which need to be revised to support IPv6. These MIBs can be categorized as follows:

1. MIB modules which define management information that is in principle IP version neutral, but the MIB currently uses addressing constructs specific to a certain IP version.
2. MIB modules which define management information that is specific to particular IP version (either IPv4 or IPv6) and which is very unlikely to ever be applicable to another IP version.

MIB modules of the first type SHOULD provide object definitions (e.g., tables) that work with all versions of IP. In particular, when revising a MIB module which contains IPv4 specific tables, it is suggested to define new tables using the textual conventions defined in this memo which support all versions of IP. The status of the new tables SHOULD be "current" while the status of the old IP version specific tables SHOULD be changed to "deprecated". The other approach of having multiple similar tables for different IP versions is strongly discouraged.

MIB modules of the second type, which are inherently IP version specific, do not need to be redefined. Note that even in this case, any additions to these MIB modules or new IP version specific MIB modules SHOULD use the textual conventions defined in this memo.





MIB developers SHOULD NOT use the textual conventions defined in this document to represent generic transport layer addresses. Instead the SMIV2 TAddress textual convention and associated definitions should be used for transport layer addresses.

The key words "MUST", "MUST NOT", "SHOULD", "SHOULD NOT" and "MAY" in this document are to be interpreted as described in [RFC 2119](#) [[RFC2119](#)].

## **2. The Internet-Standard Management Framework**

For a detailed overview of the documents that describe the current Internet-Standard Management Framework, please refer to [section 7 of RFC 3410](#) [[RFC3410](#)].

Managed objects are accessed via a virtual information store, termed the Management Information Base or MIB. MIB objects are generally accessed through the Simple Network Management Protocol (SNMP). Objects in the MIB are defined using the mechanisms defined in the Structure of Management Information (SMI). This memo specifies a MIB module that is compliant to the SMIV2, which is described in STD 58, [RFC 2578](#) [[RFC2578](#)], STD 58, [RFC 2579](#) [[RFC2579](#)] and STD 58, [RFC 2580](#) [[RFC2580](#)].

## **3. Definitions**

```
INET-ADDRESS-MIB DEFINITIONS ::= BEGIN
```

```
IMPORTS
```

```
    MODULE-IDENTITY, mib-2, Unsigned32 FROM SNMPv2-SMI
    TEXTUAL-CONVENTION          FROM SNMPv2-TC;
```

```
inetAddressMIB MODULE-IDENTITY
```

```
    LAST-UPDATED "200401020000Z"
```

```
    ORGANIZATION
```

```
        "IETF Operations and Management Area"
```

```
    CONTACT-INFO
```

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        "Juergen Schoenwaelder (Editor)
        International University Bremen
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        Phone: +49 421 200-3587
```

```
        Email: j.schoenwaelder@iu-bremen.de
```

```
        Send comments to <mibs@ops.ietf.org>."
```

```
DESCRIPTION
```

```
    "This MIB module defines textual conventions for
```



representing Internet addresses. An Internet address can be an IPv4 address, an IPv6 address or a DNS domain name. This module also defines textual conventions for Internet port numbers, autonomous system numbers and the length of an Internet address prefix.

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REVISION "200401020000Z"

DESCRIPTION

"Third version, published as RFC XXXX. This revision introduces the InetZoneIndex, InetScopeType and InetVersion textual conventions."

REVISION "200205090000Z"

DESCRIPTION

"Second version, published as [RFC 3291](#). This revisions contains several clarifications and it introduces several new textual conventions: InetAddressPrefixLength, InetPortNumber, InetAutonomousSystemNumber, InetAddressIPv4z, and InetAddressIPv6z."

REVISION "200006080000Z"

DESCRIPTION

"Initial version, published as [RFC 2851](#)."

::= { mib-2 76 }

InetAddressType ::= TEXTUAL-CONVENTION

STATUS current

DESCRIPTION

"A value that represents a type of Internet address.

unknown(0) An unknown address type. This value MUST be used if the value of the corresponding InetAddress object is a zero-length string. It may also be used to indicate an IP address which is not in one of the formats defined below.

ipv4(1) An IPv4 address as defined by the InetAddressIPv4 textual convention.

ipv6(2) An IPv6 address as defined by the InetAddressIPv6 textual convention.

ipv4z(3) A non-global IPv4 address including a zone index as defined by the InetAddressIPv4z



textual convention.

- ipv6z(4) A non-global IPv6 address including a zone index as defined by the InetAddressIPv6z textual convention.
- dns(16) A DNS domain name as defined by the InetAddressDNS textual convention.

Each definition of a concrete InetAddressType value must be accompanied by a definition of a textual convention for use with that InetAddressType.

To support future extensions, the InetAddressType textual convention SHOULD NOT be sub-typed in object type definitions.

It MAY be sub-typed in compliance statements in order to require only a subset of these address types for a compliant implementation.

Implementations must ensure that InetAddressType objects and any dependent objects (e.g. InetAddress objects) are consistent. An inconsistentValue error must be generated if an attempt to change an InetAddressType object would, for example, lead to an undefined InetAddress value. In particular, InetAddressType/InetAddress pairs must be changed together if the address type changes (e.g. from ipv6(2) to ipv4(1))."

```

SYNTAX      INTEGER {
                unknown(0),
                ipv4(1),
                ipv6(2),
                ipv4z(3),
                ipv6z(4),
                dns(16)
            }

```

```

InetAddress ::= TEXTUAL-CONVENTION
    STATUS      current
    DESCRIPTION
        "Denotes a generic Internet address.

```

An InetAddress value is always interpreted within the context of an InetAddressType value. Every usage of the InetAddress textual convention is required to specify the

InetAddressType object which provides the context. It is suggested that the

InetAddressType object is logically registered before the object(s) which use the InetAddress textual convention if

they appear in the same logical row.

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The value of an InetAddress object must always be consistent with the value of the associated InetAddressType object. Attempts to set an InetAddress object to a value which is inconsistent with the associated InetAddressType must fail with an inconsistentValue error.

When this textual convention is used as the syntax of an index object, there may be issues with the limit of 128 sub-identifiers specified in SMIV2, STD 58. In this case, the object definition MUST include a 'SIZE' clause to limit the number of potential instance sub-identifiers or else the applicable constraints MUST be stated in the appropriate conceptual row DESCRIPTION clauses or in the surrounding documentation if there is no single DESCRIPTION clause that is appropriate."

SYNTAX           OCTET STRING (SIZE (0..255))

InetAddressIPv4 ::= TEXTUAL-CONVENTION

DISPLAY-HINT "1d.1d.1d.1d"

STATUS           current

DESCRIPTION

"Represents an IPv4 network address:

octets	contents	encoding
1-4	IPv4 address	network-byte order

The corresponding InetAddressType value is ipv4(1).

This textual convention SHOULD NOT be used directly in object definitions since it restricts addresses to a specific format.

However, if it is used, it MAY be used either on its own or in conjunction with InetAddressType as a pair."

SYNTAX           OCTET STRING (SIZE (4))

InetAddressIPv6 ::= TEXTUAL-CONVENTION

DISPLAY-HINT "2x:2x:2x:2x:2x:2x:2x:2x"

STATUS           current

DESCRIPTION

"Represents an IPv6 network address:

octets	contents	encoding
1-16	IPv6 address	network-byte order

The corresponding InetAddressType value is ipv6(2).

This textual convention SHOULD NOT be used directly in object definitions since it restricts addresses to a specific format.

in                    However, if it is used, it MAY be used either on its own or

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conjunction with InetAddressType as a pair."  
SYNTAX OCTET STRING (SIZE (16))

InetAddressIPv4z ::= TEXTUAL-CONVENTION

DISPLAY-HINT "1d.1d.1d.1d%4d"

STATUS current

DESCRIPTION

"Represents a non-global IPv4 network address together with its zone index:

octets	contents	encoding
1-4	IPv4 address	network-byte order
5-8	zone index	network-byte order

The corresponding InetAddressType value is ipv4z(3).

The zone index (bytes 5-8) is used to disambiguate

identical

address values on nodes which have interfaces attached to different zones of the same scope. The zone index may

contain

the special value 0 which refers to the default zone for

each

scope.

This textual convention SHOULD NOT be used directly in

object

definitions since it restricts addresses to a specific

format.

However, if it is used, it MAY be used either on its own or

in

conjunction with InetAddressType as a pair."

SYNTAX OCTET STRING (SIZE (8))

InetAddressIPv6z ::= TEXTUAL-CONVENTION

DISPLAY-HINT "2x:2x:2x:2x:2x:2x:2x:2x%4d"

STATUS current

DESCRIPTION

"Represents a non-global IPv6 network address together with its zone index:

octets	contents	encoding
1-16	IPv6 address	network-byte order
17-20	zone index	network-byte order

The corresponding InetAddressType value is ipv6z(4).

The zone index (bytes 17-20) is used to disambiguate identical address values on nodes which have interfaces attached to different zones of the same scope. The zone

index

may contain the special value 0 which refers to the default

zone for each scope.

This textual convention SHOULD NOT be used directly in  
object

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definitions since it restricts addresses to a specific  
format.  
However, if it is used, it MAY be used either on its own or  
in  
conjunction with InetAddressType as a pair."  
SYNTAX           OCTET STRING (SIZE (20))

InetAddressDNS ::= TEXTUAL-CONVENTION  
  DISPLAY-HINT "255a"  
  STATUS       current  
  DESCRIPTION  
    "Represents a DNS domain name. The name SHOULD be fully  
    qualified whenever possible.

The corresponding InetAddressType is dns(16).

The DESCRIPTION clause of InetAddress objects that may have  
InetAddressDNS values must fully describe how (and when)  
such  
names are to be resolved to IP addresses.

This textual convention SHOULD NOT be used directly in  
object  
definitions since it restricts addresses to a specific  
format.  
However, if it is used, it MAY be used either on its own or  
in  
conjunction with InetAddressType as a pair."  
SYNTAX           OCTET STRING (SIZE (1..255))

InetAddressPrefixLength ::= TEXTUAL-CONVENTION  
  DISPLAY-HINT "d"  
  STATUS       current  
  DESCRIPTION  
    "Denotes the length of a generic Internet network address  
    prefix. A 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.

An InetAddressPrefixLength value is always interpreted  
within  
the context of an InetAddressType value. Every usage of the  
InetAddressPrefixLength textual convention is required to  
specify the InetAddressType object which provides the  
context. It is suggested that the InetAddressType object  
is  
logically registered before the object(s) which use the  
InetAddressPrefixLength textual convention if they appear  
in  
the same logical row.

InetAddressPrefixLength values that are larger than

the maximum length of an IP address for a specific InetAddressType are treated as the maximum significant value applicable for the InetAddressType. The maximum significant value is 32 for the InetAddressType 'ipv4(1)' and 'ipv4z(3)' and 128 for the InetAddressType

'ipv6(2)' and 'ipv6z(4)'. The maximum significant value for the InetAddressType 'dns(16)' is 0.

The value zero is object-specific and must be defined as part of the description of any object which uses this syntax. Examples of the usage of zero might include situations where the Internet network address prefix is unknown or does not apply."

SYNTAX Unsigned32

InetPortNumber ::= TEXTUAL-CONVENTION

DISPLAY-HINT "d"

STATUS current

DESCRIPTION

"Represents a 16 bit port number of an Internet transport layer protocol. Port numbers are assigned by IANA. A current list of all assignments is available from <http://www.iana.org/>."

The value zero is object-specific and must be defined as part of the description of any object which uses this syntax. Examples of the usage of zero might include situations where a port number is unknown, or when the value zero is used as a wildcard in a filter."

REFERENCE "STD 6 ([RFC 768](#)), STD 7 ([RFC 793](#)) and [RFC 2960](#)"

SYNTAX Unsigned32 (0..65535)

InetAutonomousSystemNumber ::= TEXTUAL-CONVENTION

DISPLAY-HINT "d"

STATUS current

DESCRIPTION

"Represents an autonomous system number which identifies 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 are currently limited to 16 bits (0..65535). There is however work in progress to enlarge

the

autonomous system number space to 32 bits. This textual convention therefore uses an Unsigned32 value without a range restriction in order to support a larger autonomous system number space."

REFERENCE "[RFC 1771](#), [RFC 1930](#)"

SYNTAX Unsigned32



```
InetScopeType ::= TEXTUAL-CONVENTION
  STATUS      current
  DESCRIPTION
    "Represents a scope type. This textual convention can be
used
    in cases where a MIB has to represent different scope types
    and there is no context information such as an InetAddress
    object which implicitly defines the scope type.

    Note that not all possible values have been assigned yet
but
    they may be assigned in future revisions of this
specification.
    Applications should therefore be able to deal with not yet
    assigned values."
  REFERENCE   "RFC 3513"
  SYNTAX      INTEGER {
    -- reserved(0),
    interfaceLocal(1),
    linkLocal(2),
    subnetLocal(3),
    adminLocal(4),
    siteLocal(5),
    -- unassigned(6),
    -- unassigned(7),
    organizationLocal(8),
    -- unassigned(9),
    -- unassigned(10),
    -- unassigned(11),
    -- unassigned(12),
    -- unassigned(13),
    global(14)
    -- reserved(15)
  }

InetZoneIndex ::= TEXTUAL-CONVENTION
  DISPLAY-HINT "d"
  STATUS      current
  DESCRIPTION
    "A zone index identifies an instance of a zone of a
    specific scope.

    The zone index MUST disambiguate identical address
    values. For link-local addresses, the zone index will
    typically be the interface index (ifIndex as defined in the
    IF-MIB) of the interface on which the address is
configured.

    The zone index may contain the special value 0 which refers
    to the default zone. The default zone may be used in cases
    where the valid zone index is not known (e.g., a management
    application needs to write a site-local IPv6 address
```

without

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knowing the site index value). The default zone SHOULD NOT  
be

used as an easy way out in cases where the zone index for a  
non-global IPv6 address is known."

REFERENCE "RFCZZZZ"

SYNTAX Unsigned32

InetVersion ::= TEXTUAL-CONVENTION

STATUS current

DESCRIPTION

"A value representing a version of the IP protocol.

unknown(0) An unknown or unspecified version of the IP  
protocol.

5).  
ipv4(1) The IPv4 protocol as defined in [RFC 791](#) (STD

ipv6(2) The IPv6 protocol as defined in [RFC 2460](#).

Note that this textual convention SHOULD NOT be used to  
distinguish different address types associated with IP  
protocols. The InetAddressType has been designed for this  
purpose."

REFERENCE "[RFC 791](#), [RFC 2460](#)"

SYNTAX INTEGER {  
    unknown(0),  
    ipv4(1),  
    ipv6(2)  
}

END

#### 4. Usage Hints

The InetAddressType and InetAddress textual conventions have been  
introduced to avoid over-constraining an object definition by the  
use

of the IPAddress SMI base type which is IPv4 specific. An  
InetAddressType/InetAddress pair can represent IP addresses in  
various formats.

The InetAddressType and InetAddress objects SHOULD NOT be sub-typed  
in object definitions. Sub-typing binds the MIB module to specific  
address formats, which may cause serious problems if new address  
formats need to be introduced. Note that it is possible to write  
compliance statements in order to express that only a subset of the  
defined address types must be implemented to be compliant.

Every usage of the InetAddress or InetAddressPrefixLength textual  
conventions must specify which InetAddressType object provides the



context for the interpretation of the InetAddress or InetAddressPrefixLength textual convention.

It is suggested that the InetAddressType object is logically registered before the object(s) which uses the InetAddress or InetAddressPrefixLength textual convention. An InetAddressType object

is logically registered before an InetAddress or InetAddressPrefixLength object if it appears before the InetAddress or InetAddressPrefixLength object in the conceptual row (which includes any index objects). This rule allows programs such as MIB compilers to identify the InetAddressType of a given InetAddress or InetAddressPrefixLength object by searching for the InetAddressType object which precedes an InetAddress or InetAddressPrefixLength object.

#### **4.1 Table Indexing**

When a generic Internet address is used as an index, both the InetAddressType and InetAddress objects MUST be used. The InetAddressType object MUST be listed before the InetAddress object in the INDEX clause.

The IMPLIED keyword MUST NOT be used for an object of type InetAddress in an INDEX clause. Instance sub-identifiers are then of the form T.N.01.02...0n, where T is the value of the InetAddressType object, 01...0n are the octets in the InetAddress object, and N is the number of those octets.

There is a meaningful lexicographical ordering to tables indexed in this fashion. Command generator applications may lookup specific addresses of known type and value, issue GetNext requests for addresses of a single type, or issue GetNext requests for a specific type and address prefix.

#### **4.2 Uniqueness of Addresses**

IPv4 addresses were intended to be globally unique, current usage notwithstanding. IPv6 addresses were architected to have different scopes and hence uniqueness [[RFC3513](#)]. In particular, IPv6 "link-local" unicast addresses are not guaranteed to be unique on any

particular node. In such cases, the duplicate addresses must be configured on different interfaces. So the combination of an IPv6 address and a zone index is unique [[RFCZZZZ](#)].

The InetAddressIPv6 textual convention has been defined to represent global IPv6 addresses and non-global IPv6 addresses in cases where no

zone index is needed (e.g., on end hosts with a single interface).

The InetAddressIPv6z textual convention has been defined to represent



non-global IPv6 addresses in cases where a zone index is needed (e.g., a router connecting multiple zones). MIB designers who use InetAddressType/InetAddress pairs therefore do not need to define additional objects in order to support non-global addresses on nodes that connect multiple zones.

The InetAddressIPv4z is intended for use in MIBs (like the TCP-MIB) which report addresses in the address family used on the wire, but where the entity instrumented obtains such addresses from applications or administrators in a form which includes a zone index, such as v4-mapped IPv6 addresses.

The size of the zone index has been chosen so that it is consistent with (i) the numerical zone index defined in [\[RFCZZZZ\]](#) and (ii) the `sin6_scope_id` field of the `sockaddr_in6` structure defined in [RFC 2553](#) [\[RFC2553\]](#).

#### **4.3 Multiple Addresses per Host**

A single host system may be configured with multiple addresses (IPv4 or IPv6), and possibly with multiple DNS names. Thus it is possible for a single host system to be accessible by multiple InetAddressType/InetAddress pairs.

If this could be an implementation or usage issue, the DESCRIPTION clause of the relevant objects must fully describe which address is reported in a given InetAddressType/InetAddress pair.

#### **4.4 Resolving DNS Names**

DNS names MUST be resolved to IP addresses when communication with the named host is required. This raises a temporal aspect to defining

MIB objects whose value is a DNS name: When is the name translated to an address?

For example, consider an object defined to indicate a forwarding destination, and whose value is a DNS name. When does the forwarding entity resolve the DNS name? Each time forwarding occurs or just once

when the object was instantiated?

The DESCRIPTION clause of such objects SHOULD precisely define how and when any required name to address resolution is done.

Similarly, the DESCRIPTION clause of such objects SHOULD precisely define how and when a reverse lookup is being done if an agent has accessed instrumentation that knows about an IP address and the MIB module or implementation requires it to map the IP address to a DNS

name.

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## 5. Table Indexing Example

This example shows a table listing communication peers that are identified by either an IPv4 address, an IPv6 address or a DNS name. The table definition also prohibits entries with an empty address (whose type would be "unknown"). The size of a DNS name is limited to 64 characters in order to satisfy OID length constraints.

```
peerTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF PeerEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "A list of communication peers."
    ::= { somewhere 1 }

peerEntry OBJECT-TYPE
    SYNTAX      PeerEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "An entry containing information about a particular peer."
    INDEX       { peerAddressType, peerAddress }
    ::= { peerTable 1 }

PeerEntry ::= SEQUENCE {
    peerAddressType    InetAddressType,
    peerAddress        InetAddress,
    peerStatus         INTEGER
}

peerAddressType OBJECT-TYPE
    SYNTAX      InetAddressType
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The type of Internet address by which the peer
         is reachable."
    ::= { peerEntry 1 }

peerAddress OBJECT-TYPE
    SYNTAX      InetAddress (SIZE (1..64))
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The Internet address for the peer. The type of this
         address is determined by the value of the peerAddressType
```





object. Note that implementations must limit themselves to a single entry in this table per reachable peer. The peerAddress may not be empty due to the SIZE restriction.

If a row is created administratively by an SNMP operation and the address type value is dns(16), then the agent stores the DNS name internally. A DNS name lookup must be performed on the internally stored DNS name whenever it is being used to contact the peer.

If a row is created by the managed entity itself and the address type value is dns(16), then the agent stores the IP address internally. A DNS reverse lookup must be performed on the internally stored IP address whenever the value is retrieved via SNMP."

```
::= { peerEntry 2 }
```

The following compliance statement specifies that compliant implementations need only support IPv4/IPv6 addresses without a zone indices. Support for DNS names or IPv4/IPv6 addresses with zone indices is not required.

```
peerCompliance MODULE-COMPLIANCE
  STATUS      current
  DESCRIPTION
    "The compliance statement of the peer MIB."

  MODULE      -- this module
  MANDATORY-GROUPS { peerGroup }

  OBJECT peerAddressType
  SYNTAX InetAddressType { ipv4(1), ipv6(2) }
  DESCRIPTION
    "An implementation is only required to support IPv4
    and IPv6 addresses without zone indices."

  ::= { somewhere 2 }
```

Note that the SMIV2 does not permit inclusion of not-accessible objects in an object group (see [section 3.1](#) in STD 58, [RFC 2580](#) [[RFC2580](#)]). It is therefore not possible to formally refine the syntax of auxiliary objects which are not-accessible. In such a case, it is suggested to express the refinement informally in the DESCRIPTION clause of the MODULE-COMPLIANCE macro invocation.



## **6. Security Considerations**

This module does not define any management objects. Instead, it defines a set of textual conventions which may be used by other MIB modules to define management objects.

Meaningful security considerations can only be written in the MIB modules that define management objects. This document has therefore no impact on the security of the Internet.

## **7. Acknowledgments**

This document was produced by the Operations and Management Area "IPv6MIB" design team. The authors would like to thank Fred Baker, Randy Bush, Richard Draves, Mark Ellison, Bill Fenner, Jun-ichiro Hagino, Mike Heard, Tim Jenkins, Glenn Mansfield, Keith McCloghrie, Thomas Narten, Erik Nordmark, Peder Chr. Norgaard, Randy Presuhn, Andrew Smith, Dave Thaler, Kenneth White, Bert Wijnen, and Brian Zill for their comments and suggestions.

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## **9. Changes from [RFC 3291](#)**

The following changes have been made relative to [RFC 3291](#):

- o Added new textual conventions InetZoneIndex, InetScopeType and InetVersion.



- o Added explicit "d" DISPLAY-HINTs for textual conventions that did not have them.
- o Updated boilerplate text and references.

## **10. Changes from [RFC 2851](#)**

The following changes have been made relative to [RFC 2851](#):

- o Added new textual conventions `InetAddressPrefixLength`, `InetAddressPortNumber`, and `InetAddressAutonomousSystemNumber`.
- o Rewrote the introduction to say clearly that in general, one should define MIB tables that work with all versions of IP. The other approach of multiple tables for different IP versions is strongly discouraged.
- o Added text to the `InetAddressType` and `InetAddress` descriptions which requires that implementations must reject set operations with an `inconsistentValue` error if they lead to inconsistencies.
- o Removed the strict ordering constraints. Description clauses now must explain which `InetAddressType` object provides the context

for

an `InetAddress` or `InetAddressPrefixLength` object.

- o Aligned wordings with the IPv6 scoping architecture document.
- o Split the `InetAddressIPv6` textual convention into the two textual conventions (`InetAddressIPv6` and `InetAddressIPv6z`) and introduced a new textual convention `InetAddressIPv4z`. Added `ipv4z(3)` and `ipv6z(4)` named numbers to the `InetAddressType` enumeration. Motivations for this change: (i) enable the introduction of a textual conventions for non-global IPv4 addresses, (ii) alignment with the textual conventions for transport addresses, (iii) simpler compliance statements in cases where support for IPv6 addresses with zone indices is not required, (iv) simplify implementations for host systems which will never have to report zone indices.

## Normative References

- [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", [BCP 14](#), [RFC 2119](#), March 1997.
- [RFC2578] McCloghrie, K., Perkins, D., Schoenwaelder, J., Case, J., Rose, M. and S. Waldbusser, "Structure of Management Information Version 2 (SMIV2)", STD 58, [RFC 2578](#), April 1999.
- [RFC2579] McCloghrie, K., Perkins, D., Schoenwaelder, J., Case, J., Rose, M. and S. Waldbusser, "Textual Conventions for SMIV2", STD 58, [RFC 2579](#), April 1999.
- [RFC2580] McCloghrie, K., Perkins, D., Schoenwaelder, J., Case, J., Rose, M. and S. Waldbusser, "Conformance Statements for



SMIPv2", STD 58, [RFC 2580](#), April 1999.

[RFC3513] Hinden, R. and S. Deering, "Internet Protocol Version 6 (IPv6) Addressing Architecture", [RFC 3513](#), April 2003.

[RFCZZZZ] Deering, S., Haberman, B., Jinmei, T., Nordmark, E., Onoe, A. and B. Zill, "IPv6 Scoped Address Architecture", [draft-ietf-ipv6-scoping-arch-00.txt](#), June 2003.

#### Informative References

[RFC3410] Case, J., Mundy, R., Partain, D. and B. Stewart, "Introduction and Applicability Statements for the Internet-Standard Management Framework", [RFC 3410](#), December 2002.

[RFC2863] McCloghrie, K. and F. Kastenholtz, "The Interfaces Group MIB", [RFC 2863](#), June 2000.

[RFC2553] Gilligan, R., Thomson, S., Bound, J. and W. Stevens, "Basic Socket Interface Extensions for IPv6", [RFC 2553](#), March 1999.

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Internet-Draft  
2004

TCS for Internet Network Addresses

January

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Funding for the RFC Editor function is currently provided by the  
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