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DS-Lite Management Information Base (MIB)
draft-ietf-softwire-dslite-mib-08

Abstract

   This memo defines a portion of the Management Information Base (MIB)
   for using with network management protocols in the Internet
   community. In particular, it defines managed objects for Dual-Stack
   Lite (DS-Lite).

Status of This Memo

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

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[1](#). Introduction

Dual-Stack Lite [[RFC6333](#)] is a solution to offer both IPv4 and IPv6
connectivity to customers crossing an IPv6 only infrastructure. One
of its key components is an IPv4-over-IPv6 tunnel, which is used to
provide IPv4 connectivity across a service provider's IPv6 network.
Another key component is a carrier-grade IPv4-IPv4 Network Address
Translation (NAT) to share service provider IPv4 addresses among
customers.

This document defines a portion of the Management Information Base
(MIB) for using with network management protocols in the Internet
community. This MIB module may be used for configuration and
monitoring devices in a Dual-Stack Lite scenario.

[2](#). Requirements Language

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

[RFC2119] when they appear in ALL CAPS. When these words are not in ALL CAPS (such as "should" or "Should"), they have their usual English meanings, and are not to be interpreted as [RFC2119] key words.

3. 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 [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 [RFC2578], [RFC2579] and [RFC2580].

4. Relationship to the IF-MIB

The Interfaces MIB [RFC2863] defines generic managed objects for managing interfaces. Each logical interface (physical or virtual)has an ifEntry. Tunnels are handled by creating a logical interface (ifEntry) for each tunnel. Each DS-Lite tunnel also acts as a virtual interface, which has a corresponding entry in the IP Tunnel MIB and Interface MIB. Those corresponding entries are indexed by ifIndex.

The ifOperStatus in ifTable is used to represent whether the DS-Lite tunnel function has been originated. The ifInUcastPkts defined in ifTable will represent the number of IPv4 packets that have been encapsulated into IPv6 packets sent to a B4. The ifOutUcastPkts defined in ifTable contains the number of IPv6 packets that can be decapsulated to IPv4 in the virtual interface. Also, the IF-MIB defines ifMtu for the MTU of this tunnel interface, so DS-Lite MIB does not need to define the MTU for the tunnel.

5. Difference from the IP tunnel MIB and NAT MIB

The key technologies for DS-Lite are IP in IP (IPv4-in-IPv6) tunnels and NAT (IPv4 to IPv4 translation).

Notes: According to section 5.2 of [RFC6333], DS-Lite only defines IPv4 in IPv6 tunnels at this moment, but other types of encapsulation could be defined in the future. So this DS-Lite MIB only supports IP in IP encapsulation, if another RFC defined other tunnel types in the future, this DS-Lite MIB will be updated then.

The NATV2-MIB [I-D.perrault-behave-natv2-mib] is designed to carry translation from any address family to any address family, therefore it supports IPv4 to IPv4 translation.

The IP Tunnel MIB [RFC4087] is designed for managing tunnels of any type over IPv4 and IPv6 networks, therefore it supports IP in IP tunnels. In a DS-Lite scenario, the tunnel type is IP in IP, more precisely, is IPv4 in IPv6. Therefore, it is unnecessary to define a new object to describe tunnel type in DS-Lite MIB.

However, the NATV2-MIB and IP Tunnel MIB together are not sufficient to support DS-Lite. This document describes the specific features for DS-Lite MIB, as below.

In a DS-Lite scenario, the Address Family Transition Router (AFTR) is not only the tunnel end concentrator, but also a 4-4 translator. So as defined in [RFC6333] , when the IPv4 packets come back from the Internet to AFTR, the AFTR knows how to reconstruct the IPv6 encapsulation by doing a reverse lookup in the extended IPv4 NAT binding table. So the NAT binding table in the AFTR MUST be extended to include the IPv6 address of the tunnel initiator. But the NAT binding entry defined in the NATV2-MIB are not extended by the object definded for the tunnel initiator. Therefore, a combined MIB is necessary.

The implementation of the IP Tunnel MIB is required for DS-Lite. The tunnelIfEncapsMethod in the tunnelIfEntry should be set to dsLite("xx"), and a corresponding entry in the DS-Lite module will exist for every tunnelIfEntry with this tunnelIfEncapsMethod. The tunnelIfRemoteInetAddress must be set to "::".

6. Structure of the MIB Module

The DS-Lite MIB provides a way to monitor and manage the devices (AFTRs) in DS-Lite scenario through SNMP.

The DS-Lite MIB is configurable on a per-interface basis. It depends on several parts of the IF-MIB [RFC2863], IP Tunnel MIB [RFC4087], and NATV2-MIB [I-D.perrault-behave-natv2-mib].

6.1. The Object Group

This Group defines objects that are needed for DS-Lite MIB.

6.1.1. The dsliteTunnel Subtree

   The dsliteTunnel subtree describes managed objects used for managing
   tunnels in the DS-Lite scenario. Because some objects defined in the
   IP Tunnel MIB are not read-write and read-only, a few new objects are
   defined in DS- Lite MIB.

6.1.2. The dsliteNAT Subtree

   The dsliteNAT subtree describes managed objects used for
   configuration as well as monitoring of AFTR which is capable of a NAT
   function. Because the NATV2-MIB supports the NAT management function
   in DS-Lite, we may reuse it in DS-Lite MIB. The dsliteNAT subtree
   also provides the information of mapping relationship between the
   tunnel entry and NAT entry by extending the IPv6 address of B4 to the
   natv2PortMapEntry in the NATV2-MIB.

6.1.3. The dsliteInfo Subtree

   The dsliteInfo subtree provides statistical information for DS-Lite.

6.2. The Notification Group

   This group defines some notification objects for DS-Lite.

6.2.1. The dsliteTrap Subtree

   The dsliteTrap subtree provides trap information in DS-Lite scenario.

6.3. The Conformance Group

   The dsliteConformance subtree provides conformance information of MIB
   objects.

7. MIB modules required for IMPORTS

   This MIB module IMPORTs objects from [RFC2578], [RFC2580], [RFC2863],
   [RFC3411], [RFC4001] and [I-D.perrault-behave-natv2-mib].

8. Definitions

   DSLite-MIB DEFINITIONS ::= BEGIN

      IMPORTS
         MODULE-IDENTITY, OBJECT-TYPE, transmission,
         NOTIFICATION-TYPE,Gauge32,TimeTicks,
         Integer32, Counter64,Unsigned32
            FROM SNMPv2-SMI

```
      OBJECT-GROUP, MODULE-COMPLIANCE,
      NOTIFICATION-GROUP
         FROM SNMPv2-CONF

      DisplayString
         FROM SNMPv2-TC

      SnmpAdminString
         FROM SNMP-FRAMEWORK-MIB

      ifIndex
         FROM IF-MIB

     InetAddress, InetAddressType, InetAddressPrefixLength,
     InetPortNumber
           FROM INET-ADDRESS-MIB

     ProtocolNumber, Natv2InstanceIndex, Natv2SubscriberIndex
          FROM NATV2-MIB;

   dsliteMIB MODULE-IDENTITY
   LAST-UPDATED "201502080000Z"          -- February 08, 2015
   ORGANIZATION "IETF Softwire Working Group"
   CONTACT-INFO
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```

          Email: flashfoxmx@gmail.com "

      DESCRIPTION
         "The MIB module is defined for management of object in the
         DS-Lite scenario.
         Copyright (C) The Internet Society (2015). This version
         of this MIB module is part of RFC yyyy; see the RFC itself
         for full legal notices. "
      REVISION   "201502080000Z"
      DESCRIPTION
         "Initial version. Published as RFC xxxx."
   --RFC Ed.: RFC-edtitor pls fill in xxxx
         ::= { transmission xxx }
   --RFC Ed.: assigned by IANA, see section 10 for details

   --Top level components of this MIB module

      dsliteMIBObjects OBJECT IDENTIFIER
         ::= { dsliteMIB 1 }
      dsliteTunnel   OBJECT IDENTIFIER
         ::= { dsliteMIBObjects 1 }

      dsliteNAT   OBJECT IDENTIFIER
         ::= { dsliteMIBObjects 2 }

      dsliteInfo   OBJECT IDENTIFIER
         ::= { dsliteMIBObjects 3 }

   --Notifications section

      dsliteNotifications OBJECT IDENTIFIER
         ::= { dsliteMIB 0 }

      dsliteTraps OBJECT IDENTIFIER
            ::= { dsliteNotifications 1 }

   --dsliteTunnel

   --dsliteTunnelTable

      dsliteTunnelTable OBJECT-TYPE
         SYNTAX   SEQUENCE OF DsliteTunnelEntry
         MAX-ACCESS not-accessible
         STATUS   current
         DESCRIPTION
            "The (conceptual) table containing information on configured

```
            tunnels. This table can be used to map B4 address to the
            associated AFTR address. It can also be used for row
            creation."
        REFERENCE
           "B4, AFTR: RFC 6333."
        ::=  { dsliteTunnel 1 }

    dsliteTunnelEntry OBJECT-TYPE
        SYNTAX      DsliteTunnelEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
           "Each entry in this table contains the information on a
            particular configured tunnel."
            INDEX   { dsliteTunnelAddressType,
                      dsliteTunnelStartAddress,
                      dsliteTunnelEndAddress,
                      ifIndex }
        ::=  { dsliteTunnelTable 1 }

    DsliteTunnelEntry  ::=
        SEQUENCE {
         dsliteTunnelAddressType    InetAddressType,
         dsliteTunnelStartAddress        InetAddress,
         dsliteTunnelEndAddress          InetAddress,
         dsliteTunnelStartAddPreLen      InetAddressPrefixLength
        }

     dsliteTunnelAddressType OBJECT-TYPE
        SYNTAX      InetAddressType
        MAX-ACCESS not-accessible
        STATUS      current
        DESCRIPTION
            " This object MUST be set to the value of ipv6(2).
              It describes the address type of the IPv4-in-IPv6
              tunnel initiator and endpoint."
         ::= { dsliteTunnelEntry 1 }

    dsliteTunnelStartAddress OBJECT-TYPE
        SYNTAX      InetAddress
        MAX-ACCESS not-accessible
        STATUS      current
        DESCRIPTION
           "The address of the initiator of the tunnel."
         ::= { dsliteTunnelEntry 2 }

    dsliteTunnelEndAddress OBJECT-TYPE
        SYNTAX      InetAddress
```

```
            MAX-ACCESS not-accessible
            STATUS     current
            DESCRIPTION
               "The address of the endpoint of the tunnel."
            ::= { dsliteTunnelEntry 3 }

       dsliteTunnelStartAddPreLen OBJECT-TYPE
            SYNTAX InetAddressPrefixLength
            MAX-ACCESS read-only
            STATUS current
            DESCRIPTION
               "IPv6 prefix length of the IP address for the
                start point of the tunnel."
            ::= { dsliteTunnelEntry 4 }



       --dsliteNAT
       --dsliteNATMapTable(The address pool defined by natv2PoolTable and
    natv2PoolRangeTable
       --in draft-perrault-behave-natv2-mib are sufficient)
       --dsliteNATBindTable(NAPT)

         dsliteNATBindTable OBJECT-TYPE
            SYNTAX     SEQUENCE OF DsliteNATBindEntry
            MAX-ACCESS not-accessible
            STATUS     current
            DESCRIPTION
               "This table contains information about currently
                active NAT binds in the NAT of AFTR. This table extends the
                IPv6 address of B4 to the natv2PortMapTable
                defined in NATV2-MIB(draft-perrault-behave-natv2-mib)."
            ::=  { dsliteNAT 1 }

       dsliteNATBindEntry OBJECT-TYPE
            SYNTAX     DsliteNATBindEntry
            MAX-ACCESS not-accessible
            STATUS     current
            DESCRIPTION
               "Each entry in this table holds the relationship between
                tunnel information and nat bind information. These entries
                are lost upon agent restart."
            INDEX   { dsliteNATBindMappingInstanceIndex,
                      dsliteNATBindMappingProto,
                      dsliteNATBindMappingExtRealm,
                      dsliteNATBindMappingExtAddressType,
                      dsliteNATBindMappingExtAddress,
                      dsliteNATBindMappingExtPort,
```

```
                 ifIndex,
```

```
                dsliteTunnelStartAddress,
                dsliteTunnelStartAddPreLen }
        ::=  {  dsliteNATBindTable 1   }

     DsliteNATBindEntry  ::=
         SEQUENCE {
         dsliteNATBindMappingInstanceIndex  Natv2InstanceIndex,
         dsliteNATBindMappingProto          ProtocolNumber,
         dsliteNATBindMappingExtRealm       SnmpAdminString,
         dsliteNATBindMappingExtAddressType InetAddressType,
         dsliteNATBindMappingExtAddress     InetAddress,
         dsliteNATBindMappingExtPort        InetPortNumber,
         dsliteNATBindMappingIntRealm       SnmpAdminString,
         dsliteNATBindMappingIntAddressType InetAddressType,
         dsliteNATBindMappingIntAddress     InetAddress,
         dsliteNATBindMappingIntPort        InetPortNumber,
         dsliteNATBindMappingPool           Unsigned32,
         dsliteNATBindMappingMapBehavior    NatBehaviorType,
         dsliteNATBindMappingFilterBehavior NatBehaviorType,
         dsliteNATBindMappingAddressPooling NatPoolingType
         }

      dsliteNATBindMappingInstanceIndex
         SYNTAX Natv2InstanceIndex
         MAX-ACCESS not-accessible
         STATUS current
         DESCRIPTION
          "Index of the NAT instance that created this port map entry."
       ::= { dsliteNATBindEntry 1 }

      dsliteNATBindMappingProto OBJECT-TYPE
         SYNTAX       ProtocolNumber
         MAX-ACCESS   not-accessible
         STATUS       current
         DESCRIPTION
         " This object specifies the mapping's transport protocol
         number."
         ::= { dsliteNATBindEntry 2 }

     dsliteNATBindMappingExtRealm OBJECT-TYPE
         SYNTAX       SnmpAdminString (SIZE(0..32))
         MAX-ACCESS not-accessible
         STATUS       current
         DESCRIPTION
         " The realm to which dsliteNATBindMappingExtAddress belongs."
         ::= { dsliteNATBindEntry 3 }

      dsliteNATBindMappingExtAddressType OBJECT-TYPE
```

```
        SYNTAX InetAddressType
        MAX-ACCESS not-accessible
        STATUS current
        DESCRIPTION
        "Type of the mapping's external address."
        ::= { dsliteNATBindEntry 4 }

    dsliteNATBindMappingExtAddress OBJECT-TYPE
        SYNTAX InetAddress (SIZE (4|16))
        MAX-ACCESS not-accessible
        STATUS current
        DESCRIPTION
        "The mapping's external address. If this is the undefined
        address, all external addresses are mapped to the internal
        address."
        ::= { dsliteNATBindEntry 5 }

     dsliteNATBindMappingExtPort OBJECT-TYPE
        SYNTAX InetPortNumber
        MAX-ACCESS not-accessible
        STATUS current
        DESCRIPTION
        "The mapping's assigned external port number. If this is zero, all
        external ports are mapped to the internal port."
        ::= { dsliteNATBindEntry 6 }

      dsliteNATBindMappingIntRealm OBJECT-TYPE
        SYNTAX SnmpAdminString
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
        "The realm to which natMappingIntAddress belongs."
        ::= { dsliteNATBindEntry 7 }

    dsliteNATBindMappingIntAddressType OBJECT-TYPE
        SYNTAX InetAddressType
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
        "Type of the mapping's internal address."
        ::= { dsliteNATBindEntry 8 }

    dsliteNATBindMappingIntAddress OBJECT-TYPE
        SYNTAX InetAddress
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
        "The mapping's internal address. If this is the undefined
```

            address, addresses are not translated."
            ::= { dsliteNATBindEntry 9 }

       dsliteNATBindMappingIntPort OBJECT-TYPE
           SYNTAX InetPortNumber
           MAX-ACCESS read-only
           STATUS current
           DESCRIPTION
            "The mapping's internal port number. If this is zero, ports
             are not translated."
            ::= { dsliteNATBindEntry 10 }

       dsliteNATBindMappingPool OBJECT-TYPE
           SYNTAX Unsigned32 (0|1..4294967295)
           MAX-ACCESS read-only
           STATUS current
           DESCRIPTION
           "Index of the pool that contains this mapping's external
           address and port. If zero, no pool is associated with this
           mapping."
           ::= { dsliteNATBindEntry 11 }

       dsliteNATBindMappingMapBehavior OBJECT-TYPE
           MAX-ACCESS read-only
           STATUS current
           DESCRIPTION
           "Mapping behavior as described in [RFC4787] section 4.1."
           REFERENCE
           "RFC 4787 section 4.1"
           SYNTAX INTEGER{
           endpointIndependent (0),
           addressDependent(1),
           addressAndPortDependent (2)
           }
           ::= { dsliteNATBindEntry 12 }

       dsliteNATBindMappingFilterBehavior OBJECT-TYPE
           MAX-ACCESS read-only
           STATUS current
           DESCRIPTION
           "Filtering behavior as described in [RFC4787] section 5."
           REFERENCE
           "RFC 4787 section 5"
           SYNTAX INTEGER{
           endpointIndependent (0),
           addressDependent(1),
           addressAndPortDependent (2)
           }

```
        ::= { dsliteNATBindEntry 13 }

dsliteNATBindMappingAddressPooling OBJECT-TYPE
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
    "Type of address pooling behavior that was used to create
    this mapping."
    REFERENCE
    "RFC 4787 section 4.1"
    SYNTAX INTEGER{
    arbitrary (0),
    paired (1)
    }
    ::= { dsliteNATBindEntry 14 }


--dsliteInfo

dsliteAFTRAlarmScalar OBJECT IDENTIFIER ::= { dsliteInfo 1 }


dsliteAFTRAlarmB4Addr OBJECT-TYPE
    SYNTAX  InetAddress
    MAX-ACCESS accessible-for-notify
    STATUS current
    DESCRIPTION
       "This object indicate the IP address of
        B4 that send alarm "
    ::= { dsliteAFTRAlarmScalar 1 }

dsliteAFTRAlarmProtocolType OBJECT-TYPE
    SYNTAX DisplayString
    MAX-ACCESS accessible-for-notify
    STATUS current
    DESCRIPTION
       "This object indicate the protocol type of alarm,
        0:tcp,1:udp,2:icmp,3:total "
    ::= { dsliteAFTRAlarmScalar 2 }

dsliteAFTRAlarmSpecificIP OBJECT-TYPE
    SYNTAX InetAddress
    MAX-ACCESS accessible-for-notify
    STATUS current
    DESCRIPTION
       " This object indicate the IP address whose port usage
        reach threshold "
    ::= { dsliteAFTRAlarmScalar 3 }
```

```
     dsliteAFTRAlarmConnectNumber OBJECT-TYPE
        SYNTAX Integer32 (60..90)
        MAX-ACCESS read-write
        STATUS current
        DESCRIPTION
           " This object indicate the threshold of DS-Lite
             connections alarm."
        ::= { dsliteAFTRAlarmScalar 4 }

   dsliteStatisticTable OBJECT-TYPE
        SYNTAX SEQUENCE OF DsliteStatisticEntry
        MAX-ACCESS not-accessible
        STATUS current
        DESCRIPTION
           "This table provides statistical information
            of DS-Lite."
        ::= { dsliteInfo 2 }

   dsliteStatisticEntry OBJECT-TYPE
        SYNTAX DsliteStatisticEntry
        MAX-ACCESS not-accessible
        STATUS current
        DESCRIPTION
           "This table provides statistical information
            of DS-Lite."
        INDEX { dsliteStatisticSubscriberIdex }
        ::= { dsliteStatisticTable 1 }

   DsliteStatisticEntry ::=
        SEQUENCE {
    dsliteStatisticSubscriberIdex        Natv2SubscriberIndex,
    dsliteStatisticDiscard               Counter64,
    dsliteStatisticTransmitted           Counter64,
    dsliteStatisticIpv4Session           Counter64,
    dsliteStatisticIpv6Session           Counter64
   }


     dsliteStatisticSubscriberIdex OBJECT-TYPE
       SYNTAX Natv2SubscriberIndex
       MAX-ACCESS not-accessible
       STATUS current
      DESCRIPTION
          "Index of the subscriber or host.A unique value,
           greater than zero, for each subscriber in the
           managed system."
        ::= { dsliteStatisticEntry 1 }
```

```
     dsliteStatisticDiscard OBJECT-TYPE
        SYNTAX Counter64
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
           " This object indicate the number of packets
             discarded from this subscriber."
        ::= { dsliteStatisticEntry 2 }

      dsliteStatisticTransmitted OBJECT-TYPE
        SYNTAX Counter64
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
           " This object indicate the number of packets received
             from or sent to this subscriber."
        ::= { dsliteStatisticEntry 3 }

     dsliteStatisticIpv4Session OBJECT-TYPE
        SYNTAX Counter64
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
           " This object indicate the number of the
             current IPv4 Session."
        ::= { dsliteStatisticEntry 4 }

     dsliteStatisticIpv6Session OBJECT-TYPE
        SYNTAX Counter64
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
          " This object indicate the number of the
             current IPv6 Session."
        ::= { dsliteStatisticEntry 5 }

   ---dslite trap

     dsliteTunnelNumAlarm NOTIFICATION-TYPE
        OBJECTS { dsliteAFTRAlarmProtocolType,
              dsliteAFTRAlarmB4Addr }
        STATUS current
        DESCRIPTION
           "This trap is triggered when the number of
            current connecting dslite tunnel exceeds the value of
            dsliteAFTRAlarmConnectNumber."
        ::= { dsliteTraps 1 }
```

```
      dsliteAFTRUserSessionNumAlarm NOTIFICATION-TYPE
         OBJECTS { dsliteAFTRAlarmProtocolType,
                dsliteAFTRAlarmB4Addr }
         STATUS current
         DESCRIPTION
         " This trap is triggered when sessions of
           user reach the threshold."
         ::= { dsliteTraps 2 }

       dsliteAFTRPortUsageOfSpecificIpAlarm NOTIFICATION-TYPE
         OBJECTS {  dsliteAFTRAlarmSpecificIP }
         STATUS current
         DESCRIPTION
            "This trap is triggered when used NAT
             ports of map address reach the threshold."
         ::= { dsliteTraps 3 }

   --Module Conformance statement

      dsliteConformance   OBJECT IDENTIFIER
         ::=  { dsliteMIB 2 }

      dsliteCompliances OBJECT IDENTIFIER ::= { dsliteConformance 1 }

      dsliteGroups OBJECT IDENTIFIER ::= { dsliteConformance 2 }

   -- compliance statements

      dsliteCompliance MODULE-COMPLIANCE
         STATUS current
         DESCRIPTION
            " Description the minimal requirements for conformance
              to the DS-Lite MIB."
         MODULE -- this module
            MANDATORY-GROUPS { dsliteNATBindGroup,
                 dsliteTunnelGroup,
                 dsliteStatisticGroup,
                 dsliteTrapsGroup,dsliteAFTRAlarmScalarGroup }
          ::= { dsliteCompliances 1 }

      dsliteNATBindGroup OBJECT-GROUP
         OBJECTS {
                  dsliteNATBindMappingIntRealm,
                  dsliteNATBindMappingIntAddressType,
                  dsliteNATBindMappingIntAddress,
                  dsliteNATBindMappingIntPort,
                  dsliteNATBindMappingPool,
                  dsliteNATBindMappingMapBehavior,
```

```
                    dsliteNATBindMappingFilterBehavior,
                    dsliteNATBindMappingAddressPooling }
        STATUS current
        DESCRIPTION
          " The collection of this objects are used to give the
            information about NAT Bind."
         ::= { dsliteGroups 1 }

    dsliteTunnelGroup OBJECT-GROUP
        OBJECTS { dsliteTunnelStartAddPreLen }
        STATUS current
        DESCRIPTION
          " The collection of this objects are used to give the
            information of tunnel in ds-lite."
        ::= { dsliteGroups 2 }

    dsliteStatisticGroup OBJECT-GROUP
        OBJECTS { dsliteStatisticDiscard,
                  dsliteStatisticTransmitted,
                  dsliteStatisticIpv4Session,
                  dsliteStatisticIpv6Session }
      STATUS current
      DESCRIPTION
          " The collection of this objects are used to give the
            statistical information of ds-lite."
         ::= { dsliteGroups 3 }

    dsliteTrapsGroup NOTIFICATION-GROUP
        NOTIFICATIONS { dsliteTunnelNumAlarm,
                        dsliteAFTRUserSessionNumAlarm,
                        dsliteAFTRPortUsageOfSpecificIpAlarm }
        STATUS current
        DESCRIPTION
          "The collection of this objects are used to give the
            trap information of ds-lite."
        ::= { dsliteGroups 4 }

     dsliteAFTRAlarmScalarGroup OBJECT-GROUP
        OBJECTS { dsliteAFTRAlarmB4Addr, dsliteAFTRAlarmProtocolType,
             dsliteAFTRAlarmSpecificIP,
            dsliteAFTRAlarmConnectNumber }
        STATUS current
        DESCRIPTION
          " The collection of this objects are used to give the
            information about AFTR alarming Scalar."
        ::= { dsliteGroups 5 }

            END
```

9. Security Considerations

   There are a number of management objects defined in this MIB module
   with a MAX-ACCESS clause of read-write and/or read-create. Such
   objects may be considered sensitive or vulnerable in some network
   environments. The support for SET operations in a non-secure
   environment without proper protection can have a negative effect on
   network operations. These are the tables and objects and their
   sensitivity/vulnerability:

      Notification thresholds: An attacker setting an arbitrarily low
      treshold can cause many useless notifications to be generated.
      Setting an arbitrarily high threshold can effectively disable
      notifications, which could be used to hide another attack.

      dsliteAFTRAlarmConnectNumber

   Some of the readable objects in this MIB module (i.e., objects with a
   MAX-ACCESS other than not-accessible) may be considered sensitive or
   vulnerable in some network environments. It is thus important to
   control even GET and/or NOTIFY access to these objects and possibly
   to even encrypt the values of these objects when sending them over
   the network via SNMP. These are the tables and objects and their
   sensitivity/vulnerability:

      dsliteTunnelStartAddPreLen

      dsliteNATBindMappingIntRealm

      dsliteNATBindMappingIntAddressType

      dsliteNATBindMappingIntAddress

      dsliteNATBindMappingIntPort

      dsliteNATBindMappingPool

      dsliteNATBindMappingMapBehavior

      dsliteNATBindMappingFilterBehavior

      dsliteNATBindMappingAddressPooling

      dsliteStatisticDiscard

      dsliteStatisticTransmitted

      dsliteStatisticIpv4Session

          dsliteStatisticIpv6Session

   SNMP versions prior to SNMPv3 did not include adequate security.
   Even if the network itself is secure (for example by using IPSec),
   even then, there is no control as to who on the secure network is
   allowed to access and GET/SET (read/change/create/delete) the objects
   in this MIB module.

   Implementations SHOULD provide the security features described by the
   SNMPv3 framework (see [RFC3410]), and implementations claiming
   compliance to the SNMPv3 standard MUST include full support for
   authentication and privacy via the User-based Security Model (USM)
   [RFC3414] with the AES cipher algorithm [RFC3826]. Implementations
   MAY also provide support for the Transport Security Model (TSM)
   [RFC5591] in combination with a secure transport such as SSH
   [RFC5592] or TLS/DTLS [RFC6353].

   Further, deployment of SNMP versions prior to SNMPv3 is NOT
   RECOMMENDED. Instead, it is RECOMMENDED to deploy SNMPv3 and to
   enable cryptographic security. It is then a customer/operator
   responsibility to ensure that the SNMP entity giving access to an
   instance of this MIB module is properly configured to give access to
   the objects only to those principals (users) that have legitimate
   rights to indeed GET or SET (change/create/delete) them.

10. IANA Considerations

   The MIB module in this document uses the following IANA-assigned
   OBJECT IDENTIFIER values recorded in the SMI Numbers registry, and
   the following IANA-assigned tunnelType values recorded in the
   IANAtunnelType-MIB registry:

        Descriptor   OBJECT IDENTIFIER value
        ----------   -----------------------
        DSLite-MIB   { transmission XXX }

        IANAtunnelType ::= TEXTUAL-CONVENTION

                   SYNTAX   INTEGER {

                        dsLite ("XX")   -- dslite tunnel

                        }

   Notes: As Appendix A of the IP Tunnel MIB[RFC4087] described that it
   has already assigned the value direct(2) to indicate the tunnel type
   is IP in IP tunnel, but it is still difficult to distinguish DS-Lite

tunnel packets from normal IP in IP tunnel packets in the scenario of
the AFTR connecting to both a DS-lite tunnel and an IP in IP tunnel.

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12. References

12.1. Normative References

[I-D.perrault-behave-natv2-mib]
          Perreault, S., Tsou, T., Sivakumar, S., and T. Taylor,
          "Definitions of Managed Objects for Network Address
          Translators (NAT)", draft-perrault-behave-natv2-mib-00
          (work in progress), January 2015.

[RFC2578] McCloghrie, K., Ed., Perkins, D., Ed., and J.
          Schoenwaelder, Ed., "Structure of Management Information
          Version 2 (SMIv2)", STD 58, RFC 2578, April 1999.

[RFC2580] McCloghrie, K., Perkins, D., and J. Schoenwaelder,
          "Conformance Statements for SMIv2", STD 58, RFC 2580,
          April 1999.

[RFC2863] McCloghrie, K. and F. Kastenholz, "The Interfaces Group
          MIB", RFC 2863, June 2000.

[RFC3411] Harrington, D., Presuhn, R., and B. Wijnen, "An
          Architecture for Describing Simple Network Management
          Protocol (SNMP) Management Frameworks", STD 62, RFC 3411,
          December 2002.

[RFC4001] Daniele, M., Haberman, B., Routhier, S., and J.
          Schoenwaelder, "Textual Conventions for Internet Network
          Addresses", RFC 4001, February 2005.

[RFC4008] Rohit, R., Srisuresh, P., Raghunarayan, R., Pai, N., and
          C. Wang, "Definitions of Managed Objects for Network
          Address Translators (NAT)", RFC 4008, March 2005.

[RFC4087] Thaler, D., "IP Tunnel MIB", RFC 4087, June 2005.

   [RFC6333] Durand, A., Droms, R., Woodyatt, J., and Y. Lee, "Dual-
              Stack Lite Broadband Deployments Following IPv4
              Exhaustion", RFC 6333, August 2011.

12.2. Informative References

   [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate
              Requirement Levels", BCP 14, RFC 2119, March 1997.

   [RFC2579] McCloghrie, K., Ed., Perkins, D., Ed., and J.
              Schoenwaelder, Ed., "Textual Conventions for SMIv2", STD
              58, RFC 2579, April 1999.

   [RFC2629] Rose, M., "Writing I-Ds and RFCs using XML", RFC 2629,
              June 1999.

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

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