DS-Lite Management Information Base (MIB) for AFTRs
draft-ietf-softwire-dslite-mib-15

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 Address Family Transition Routers (AFTRs) of 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.

Internet-Drafts are working documents of the Internet Engineering Task Force (IETF). Note that other groups may also distribute working documents as Internet-Drafts. The list of current Internet-Drafts is at http://datatracker.ietf.org/drafts/current/.

Internet-Drafts are draft documents valid for a maximum of six months and may be updated, replaced, or obsoleted by other documents at any time. It is inappropriate to use Internet-Drafts as reference material or to cite them other than as "work in progress."

This Internet-Draft will expire on July 6, 2016.

Copyright Notice

Copyright (c) 2016 IETF Trust and the persons identified as the document authors. All rights reserved.

This document is subject to BCP 78 and the IETF Trust’s Legal Provisions Relating to IETF Documents (http://trustee.ietf.org/license-info) in effect on the date of publication of this document. Please review these documents carefully, as they describe your rights and restrictions with respect to this document. Code Components extracted from this document must
1. Introduction

Dual-Stack Lite [RFC6333] is a solution to offer both IPv4 and IPv6
c 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 Address Family Transition Routers (AFTRs) 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 endpoint 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 triggered. 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 NATv2-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 defines other tunnel types in the future, this DS-Lite MIB will be updated then.

The NATV2-MIB [RFC7659] 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 has already supports IP in IP tunnels. But in a DS-Lite scenario, the tunnel type is point-to-multipoint IP in IP tunnels. The direct(2) defined in IP Tunnel MIB only supports point-to-point tunnel. So it needs to define a new tunnel type for DS-Lite.

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 the DS-Lite scenario, the Address Family Transition Router (AFTR) is not only the tunnel end concentrator, but also an IPv4-to-IPv4 NAT. So as defined in [RFC6333], when the IPv4 packets come back from the Internet to the AFTR, it knows how to reconstruct the IPv6 encapsulation by doing a reverse lookup in the extended IPv4 NAT binding table (section 6.6 of [RFC6333]). The NAT binding table in the AFTR is extended to include the IPv6 address of the tunnel initiator. However, the NAT binding information defined in NATV2-MIB as natv2PortMapTable is indexed by the NAT instance, protocol, and external realm and address. Because the tunnelIfTable defined in the TUNNEL-MIB [RFC4087] is indexed by the ifIndex, the DS-Lite-MIB needs to define the tunnel objects to extend the NAT binding entry by interface. Therefore, a combined MIB is necessary.

An implementation of the IP Tunnel MIB is required for DS-Lite. As the tunnel is not point-to-point in DS-Lite, it needs to define a new tunnel type for DS-Lite. And 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 a 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 [RFC7659].

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 the tunnelInetConfigLocalAddress and tunnelInetConfigRemoteAddress defined in the IP Tunnel MIB are not readable, 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 an 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 mapping information between the tunnel entry (dsliteTunnelEntry) and the NAT entry (dsliteNATBindEntry) by adding the IPv6 address of the 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 a 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 [RFC7659].
8. Definitions

DSLite-MIB DEFINITIONS ::= BEGIN

IMPORTS
    MODULE-IDENTITY, OBJECT-TYPE, mib-2,
    NOTIFICATION-TYPE, Integer32,
    Counter64, Unsigned32  
    FROM SNMPv2-SMI

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

    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 "201601030000Z" -- January 03, 2016
ORGANIZATION "IETF Softwire Working Group"
CONTACT-INFO
 "Yu Fu
 CNNIC
 No.4 South 4th Street, Zhongguancun, Hai-Dian District
 Beijing, P.R. China 100090
 EMail: fuyu@cnnic.cn

 Sheng Jiang
 Huawei Technologies Co., Ltd
 Huawei Building, 156 Beiqing Rd., Hai-Dian District
 Beijing, P.R. China 100095
 EMail: jiangsheng@huawei.com

 Jiang Dong
 Tsinghua University
 Department of Computer Science, Tsinghua University
 Beijing 100084
 P.R. China
The MIB module is defined for management of objects in the DS-Lite scenario. Copyright (C) The Internet Society (2016). This version of this MIB module is part of RFC yyyy; see the RFC itself for full legal notices. "

---RFC Ed.: RFC-editor pls fill in xxxx
::= { mib-2 xxxx }
---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 }

---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 a B4 address to the associated AFTR address. It can also be used for row creation."
REFERENCE
"B4, AFTR: RFC6333."
::= { 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."
REFERENCE
"ipv6(2): RFC4001."
::= { dsliteTunnelEntry 1 }

dsliteTunnelStartAddress OBJECT-TYPE
SYNTAX InetAddress (SIZE (0..16))
MAX-ACCESS not-accessible

STATUS     current
DESCRIPTION
"The IPv6 address of the initiator of the tunnel
The address type is given by dsliteTunnelAddressType."
::= { dsliteTunnelEntry 2 }

dsliteTunnelEndAddress OBJECT-TYPE
SYNTAX     InetAddress (SIZE (0..16))
MAX-ACCESS not-accessible
STATUS     current
DESCRIPTION
"The IPv6 address of the endpoint of the tunnel
The address type is given by dsliteTunnelAddressType."
::= { dsliteTunnelEntry 3 }

dsliteTunnelStartAddrPreLen OBJECT-TYPE
SYNTAX     InetAddressPrefixLength
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The IPv6 prefix length of the IP address for the
initiator of the tunnel(dsliteTunnelStartAddress)."
::= { dsliteTunnelEntry 4 }

--dsliteNATBindTable(according to the NAPT scheme)

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 the AFTR. This table
adds the IPv6 address of a B4 to the natv2PortMapTable
defined in NATV2-MIB (RFC7659)."
REFERENCE
"NATV2-MIB: section 4 of RFC7659."
::= { dsliteNAT 1 }

dsliteNATBindEntry OBJECT-TYPE
SYNTAX     DsliteNATBindEntry
MAX-ACCESS not-accessible
STATUS     current
DESCRIPTION
"The entry in this table holds the mapping relationship
between tunnel information and NAT bind information.
Each entry in this table not only need to match a
corresponding entry in the natv2PortMapTable but also a corresponding entry in the dsliteTunnelTable. So the INDEX of the entry needs to match a corresponding value in the natv2PortMapTable INDEX and a corresponding value in the dsliteTunnelTable INDEX. These entries are lost upon agent restart.

REFERENCE
"natv2PortMapTable: section 4 of RFC7659."

INDEX   { dsliteNATBindMappingInstanceIndex,
      dsliteNATBindMappingProto,
      dsliteNATBindMappingExtRealm,
      dsliteNATBindMappingExtAddressType,
      dsliteNATBindMappingExtAddress,
      dsliteNATBindMappingExtPort,
      ifIndex,
      dsliteTunnelStartAddress }
::= { 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     INTEGER,
      dsliteNATBindMappingFilterBehavior  INTEGER,
      dsliteNATBindMappingAddressPooling  INTEGER }

dsliteNATBindMappingInstanceIndex OBJECT-TYPE
   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
"Address type for the mapping’s external address. This object MUST be set to the value of IPv4(1). The values of ipv6(2), ipv4z(3) and ipv6z(4) are not allowed."
REFERENCE
"ipv4(1), ipv6(2), IPv4z(3) and ipv6z(4): RFC4001."
::= { dsliteNATBindEntry 4 }

dsliteNATBindMappingExtAddress OBJECT-TYPE
SYNTAX InetAddress (SIZE (0..4))
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"The mapping’s external address. This is the source address for translated outgoing packets. The address type is given by dsliteNATBindMappingExtAddressType."
::= { dsliteNATBindEntry 5 }

dsliteNATBindMappingExtPort OBJECT-TYPE
SYNTAX InetPortNumber
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"The mapping’s assigned external port number. This is the source port for translated outgoing packets. This MUST be a non-zero value."
::= { dsliteNATBindEntry 6 }
dsliteNATBindMappingIntRealm OBJECT-TYPE
SYNTAX SnmpAdminString (SIZE(0..32))
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The realm to which natMappingIntAddress belongs. This
realm defines the IPv6 address space from which the
tunnel source address is taken. The realm of the
encapsulated IPv4 address is restricted in scope to
the tunnel, so there is no point in identifying it
separately."
::= { dsliteNATBindEntry 7 }

dsliteNATBindMappingIntAddressType OBJECT-TYPE
SYNTAX InetAddressType
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"Address type of the mapping’s internal address.
This object MUST be set to the value of iPv4z(3).
The values of ipv4(1), ipv6(2) and ipv6z(4) are
not allowed."
REFERENCE
"ipv4(1), ipv6(2), iPv4z(3) and ipv6z(4): RFC4001."
::= { dsliteNATBindEntry 8 }

dsliteNATBindMappingIntAddress OBJECT-TYPE
SYNTAX InetAddress
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The mapping’s internal address. It is the IPv6 tunnel
source address. The address type is given by
dsliteNATBindMappingIntAddressType."
::= { dsliteNATBindEntry 9 }

dsliteNATBindMappingIntPort OBJECT-TYPE
SYNTAX InetPortNumber
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The mapping’s internal port number. This MUST be a non-zero
value."
::= { 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
SYNTAX INTEGER{
  endpointIndependent (0),
  addressDependent(1),
  addressAndPortDependent (2)
}
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"Mapping behavior as described in [RFC4787] section 4.1.

endpointIndependent(0), the behavior REQUIRED by RFC4787, REQ-1, maps the source address and port to the same external address and port for all destination address and port combinations reached through the same external realm and using the given protocol.

addressDependent(1) maps to the same external address and port for all destination ports at the same destination address reached through the same external realm and using the given protocol.

addressAndPortDependent(2) maps to a separate external address and port combination for each different destination address and port combination reached through the same external realm.

For the DS-Lite scenario, it must be addressAndPortDependent(2)."
REFERENCE
"Mapping behavior: section 4.1 of RFC4787.
DS-Lite: RFC 6333."
::= { dsliteNATBindEntry 12 }

dsliteNATBindMappingFilterBehavior OBJECT-TYPE
SYNTAX INTEGER{
  endpointIndependent (0),
  addressDependent(1),
  addressAndPortDependent (2)
}
MAX-ACCESS read-only
endPointIndependent(0) accepts for translation packets from all combinations of remote address and port destined to the mapped external address and port via the given external realm and using the given protocol.

addressDependent(1) accepts for translation packets from all remote ports from the same remote source address destined to the mapped external address and port via the given external realm and using the given protocol.

addressAndPortDependent(2) accepts for translation only those packets with the same remote source address, port, and protocol incoming from the same external realm as identified when the applicable port map entry was created.

RFC 4787, REQ-8 recommends either endPointIndependent(0) or addressDependent(1) filtering behavior depending on whether application friendliness or security takes priority.

For the DS-Lite scenario, it must be addressAndPortDependent(2)."

REFERENCE
"Filtering behavior: section 5 of RFC4787.
DS-Lite: RFC6333."
 ::= { dsliteNATBindEntry 13 }

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

arbitrary(0) pooling behavior means that the NAT instance may create the new port mapping using any address in the pool that has a free port for the protocol concerned.

paired(1) pooling behavior, the behavior RECOMMENDED by RFC..."
4787, REQ-2, means that once a given internal address has been mapped to a particular address in a particular pool, further mappings of the same internal address to that pool will reuse the previously assigned pool member address."

REFERENCE
"Pooling behavior: section 4.1 of RFC4787."

::= { dsliteNATBindEntry 14 }

--dsliteInfo

dsliteAFTRAalarmScalar OBJECT IDENTIFIER ::= { dsliteInfo 1 }

dsliteAFTRAalarmB4AddrType OBJECT-TYPE
SYNTAX InetAddressType
MAX-ACCESS accessible-for-notify
STATUS current
DESCRIPTION
"This object indicates the address type of the B4 which will send an alarm."
::= { dsliteAFTRAalarmScalar 1 }

dsliteAFTRAalarmB4Addr OBJECT-TYPE
SYNTAX InetAddress
MAX-ACCESS accessible-for-notify
STATUS current
DESCRIPTION
"This object indicates the IP address of B4 which will send an alarm. The address type is given by dsliteAFTRAalarmB4AddrType."
::= { dsliteAFTRAalarmScalar 2 }

dsliteAFTRAalarmProtocolType OBJECT-TYPE
SYNTAX INTEGER(
tcp (0),
udp (1),
icmp (2),
total (3)
)
MAX-ACCESS accessible-for-notify
STATUS current
DESCRIPTION
"This object indicates the transport protocol type of alarm.

tcp (0) means that the transport protocol type of alarm is tcp."
udp (1) means that the transport protocol type of alarm is udp.

icmp (2) means that the transport protocol type of alarm is icmp.

total (3) means that the transport protocol type of alarm is total."
::= { dsliteAFTRAAlarmScalar 3 }

dsliteAFTRAAlarmSpecificIPAddrType OBJECT-TYPE
SYNTAX InetAddressType
MAX-ACCESS accessible-for-notify
STATUS current
DESCRIPTION
"This object indicates the address type of the IP address whose port usage has reached the threshold."
::= { dsliteAFTRAAlarmScalar 4 }

dsliteAFTRAAlarmSpecificIP OBJECT-TYPE
SYNTAX InetAddress
MAX-ACCESS accessible-for-notify
STATUS current
DESCRIPTION
"This object indicates the IP address whose port usage has reached the threshold. The address type is given by dsliteAFTRAAlarmSpecificIPAddrType."
::= { dsliteAFTRAAlarmScalar 5 }

dsliteAFTRAAlarmConnectNumber OBJECT-TYPE
SYNTAX Integer32 (60..90)
MAX-ACCESS read-write
STATUS current
DESCRIPTION
"This object indicates the notification threshold of the DS-Lite tunnels which is active in the AFTR device."
REFERENCE
"AFTR: section 6 of RFC6333."
DEFVAL
{ 60 }
::= { dsliteAFTRAAlarmScalar 6 }

dsliteAFTRAAlarmSessionNumber OBJECT-TYPE
SYNTAX Integer32
MAX-ACCESS read-write
STATUS current
DESCRIPTION
"This object indicates the notification threshold of the IPv4 session for the user."

REFERENCE
"AFTR: section 6 of RFC6333
B4: section 5 of RFC6333."

DEFVAL
{ -1 }
::= { dsliteAFTRAAlarmScalar 7 }

dsliteAFTRAAlarmPortNumber OBJECT-TYPE
SYNTAX Integer32
MAX-ACCESS read-write
STATUS current
DESCRIPTION
"This object indicates the notification threshold of the NAT ports which have been used by user."

DEFVAL
{ -1 }
::= { dsliteAFTRAAlarmScalar 8 }

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

dsliteStatisticsEntry OBJECT-TYPE
SYNTAX DsliteStatisticsEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"Each entry in this table provides statistical information about DS-Lite."
INDEX { dsliteStatisticsSubscriberIndex }
::= { dsliteStatisticsTable 1 }

DsliteStatisticsEntry ::= SEQUENCE {
  dsliteStatisticsSubscriberIndex        Natv2SubscriberIndex,
  dsliteStatisticsDiscards               Counter64,
  dsliteStatisticsSends                  Counter64,
  dsliteStatisticsReceives               Counter64,
  dsliteStatisticsIpv4Session            Counter64,
  dsliteStatisticsIpv6Session            Counter64
}
dsliteStatisticsSubscriberIndex 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."
::= { dsliteStatisticsEntry 1 }

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

dsliteStatisticsSends OBJECT-TYPE
SYNTAX Counter64
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"This object indicates the number of packets which is sent to this subscriber."
::= { dsliteStatisticsEntry 3 }

dsliteStatisticsReceives OBJECT-TYPE
SYNTAX Counter64
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"This object indicates the number of packets which is received from this subscriber."
::= { dsliteStatisticsEntry 4 }

dsliteStatisticsIpv4Session OBJECT-TYPE
SYNTAX Counter64
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"This object indicates the number of the current IPv4 Sessions."
REFERENCE
"Session: the paragraph 2 of RFC6333 section 11. (The AFTR should have the capability to log the tunnel-id, protocol, ports/IP addresses, and
the creation time of the NAT binding to uniquely identify the user sessions)."
::= { dsliteStatisticsEntry 5 }

dsliteStatisticsIpv6Session OBJECT-TYPE
SYNTAX Counter64
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"This object indicates the number of the current IPv6 Session. Because the AFTR is also a dual-stack device, it will also forward normal IPv6 packets for the inbound and outbound direction."
REFERENCE
"Session: the paragraph 2 of RFC6333 section 11. (The AFTR should have the capability to log the tunnel-id, protocol, ports/IP addresses, and the creation time of the NAT binding to uniquely identify the user sessions)."
::= { dsliteStatisticsEntry 6 }

---dslite Notifications

dsliteTunnelNumAlarm NOTIFICATION-TYPE
OBJECTS { dsliteAFTRAlarmProtocolType,
           dsliteAFTRAlarmB4AddrType,
           dsliteAFTRAlarmB4Addr }
STATUS current
DESCRIPTION
"This trap is triggered when the number of current dslite tunnels exceeds the value of dsliteAFTRAlarmConnectNumber."
::= { dsliteNotifications 1 }

dsliteAFTRUserSessionNumAlarm NOTIFICATION-TYPE
OBJECTS { dsliteAFTRAlarmProtocolType,
           dsliteAFTRAlarmB4AddrType,
           dsliteAFTRAlarmB4Addr }
STATUS current
DESCRIPTION
"This trap is triggered when user sessions reach the threshold. The threshold is specified by the dsliteAFTRAlarmSessionNumber."
REFERENCE
"Session: the paragraph 2 of RFC6333 section 11. (The AFTR should have the capability to log the tunnel-id, protocol, ports/IP addresses, and
the creation time of the NAT binding to uniquely identify the user sessions)."

::= { dsliteNotifications 2 }

dsliteAFTRPortUsageOfSpecificIpAlarm NOTIFICATION-TYPE
OBJECTS { dsliteAFTRAlarmSpecificIPAddrType,
            dsliteAFTRAlarmSpecificIP }

STATUS current
DESCRIPTION
"This trap is triggered when the used NAT ports of map address reach the threshold.
The threshold is specified by the dsliteAFTRAlarmPortNumber."
::= { dsliteNotifications 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
"Describes the minimal requirements for conformance to the DSLite-MIB."
MODULE -- this module
MANDATORY-GROUPS { dsliteNATBindGroup,
                   dsliteTunnelGroup,
                   dsliteStatisticsGroup,
                   dsliteNotificationsGroup,
                   dsliteAFTRAlarmScalarGroup }
::= { dsliteCompliances 1 }

dsliteNATBindGroup OBJECT-GROUP
OBJECTS {
    dsliteNATBindMappingIntRealm,
    dsliteNATBindMappingIntAddressType,
    dsliteNATBindMappingIntAddress,
    dsliteNATBindMappingIntPort,
    dsliteNATBindMappingPool,
    dsliteNATBindMappingMapBehavior,
    dsliteNATBindMappingFilterBehavior,
dsliteNATBindMappingAddressPooling)
STATUS current
DESCRIPTION
"A collection of objects to support basic
management of NAT binds in the NAT of the AFTR."
::= { dsliteGroups 1 }
dsliteTunnelGroup OBJECT-GROUP
OBJECTS { dsliteTunnelStartAddPreLen }
STATUS current
DESCRIPTION
"A collection of objects to support management
of ds-lite tunnels."
::= { dsliteGroups 2 }
dsliteStatisticsGroup OBJECT-GROUP
OBJECTS { dsliteStatisticsDiscards,
dsliteStatisticsSends,
dsliteStatisticsReceive,
dsliteStatisticsIpv4Session,
dsliteStatisticsIpv6Session }
STATUS current
DESCRIPTION
"A collection of objects to support management
of statistical information for AFTR devices."
::= { dsliteGroups 3 }
dsliteNotificationsGroup NOTIFICATION-GROUP
NOTIFICATIONS { dsliteTunnelNumAlarm,
dsliteAFTRUserSessionNumAlarm,
dsliteAFTRPortUsageOfSpecificIpAlarm }
STATUS current
DESCRIPTION
"A collection of objects to support management
of trap information for AFTR devices."
::= { dsliteGroups 4 }
dsliteAFTRAlarmScalarGroup OBJECT-GROUP
OBJECTS { dsliteAFTRAlarmB4AddrType,
dsliteAFTRAlarmB4Addr,
dsliteAFTRAlarmProtocolType,
dsliteAFTRAlarmSpecificIPv4AddrType,
dsliteAFTRAlarmSpecificIP,
dsliteAFTRAlarmConnectNumber,
dsliteAFTRAlarmSessionNumber,
dsliteAFTRAlarmPortNumber }
STATUS current
DESCRIPTION
"A collection of objects to support management of the information about AFTR alarming Scalar."

::= { dsliteGroups 5 }

END

9. Security Considerations

There are three objects defined in this MIB module with a MAX-ACCESS clause of read-write. 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 opens devices to attack. These are the tables and objects and their sensitivity/vulnerability:

Notification thresholds: An attacker setting an arbitrarily low threshold 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
   dsliteAFTRAlarmSessionNumber
   dsliteAFTRAlarmPortNumber

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:

Objects that reveal host identities: Various objects can reveal the identity of private hosts that are engaged in a session with external end nodes. A curious outsider could monitor these to assess the number of private hosts being supported by the AFTR device. Further, a disgruntled former employee of an enterprise could use the information to break into specific private hosts by intercepting the existing sessions or originating new sessions into the host. If nothing else, unauthorized monitoring of these objects will violate individual subscribers’ privacy.

   entries in dsliteTunnelTable
   entries in dsliteNATBindTable
Unauthorized read access to the dsliteTunnelTable would reveal information about the tunnel topology.

SNMP versions prior to SNMPv3 did not include adequate security. Even if the network itself is secure (for example by using IPSec), 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 value recorded in the SMI Numbers registry, and the following IANA-assigned tunnelType value recorded in the IANAtunnelType-MIB registry:

<table>
<thead>
<tr>
<th>Descriptor</th>
<th>OBJECT IDENTIFIER value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DSLite-MIB</td>
<td>{ mib-2 XXX }</td>
</tr>
</tbody>
</table>

IANAtunnelType ::= TEXTUAL-CONVENTION

SYNTAX INTEGER {
    dsLite ("XX") -- dslite tunnel
}

---

11. Acknowledgements

The authors would like to thank the valuable comments made by Suresh
Krishnan, Ian Farrer, Yiu Lee, Qi Sun, Yong Cui, David Harrington,
Dave Thaler, Tassos Chatzithomaoglou, Tom Taylor, Hui Deng, Carlos
Pignataro, Matt Miller, Terry Manderson and other members of The
SOFTWIRE WG.

This document was produced using the xml2rfc tool [RFC2629].

12. References

12.1. Normative References

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate
Requirement Levels", BCP 14, RFC 2119,
DOI 10.17487/RFC2119, March 1997,

Schoenwaelder, Ed., "Structure of Management Information
Version 2 (SMIv2)", STD 58, RFC 2578,
DOI 10.17487/RFC2578, April 1999,

Schoenwaelder, Ed., "Conformance Statements for SMIv2",
STD 58, RFC 2580, DOI 10.17487/RFC2580, April 1999,

[RFC2863] McCloghrie, K. and F. Kastenholtz, "The Interfaces Group
MIB", RFC 2863, DOI 10.17487/RFC2863, June 2000,

Architecture for Describing Simple Network Management
Protocol (SNMP) Management Frameworks", STD 62, RFC 3411,
DOI 10.17487/RFC3411, December 2002,

[RFC4001] Daniele, M., Haberman, B., Routhier, S., and J.
Schoenwaelder, "Textual Conventions for Internet Network
Addresses", RFC 4001, DOI 10.17487/RFC4001, February 2005,

[RFC4087] Thaler, D., "IP Tunnel MIB", RFC 4087,
DOI 10.17487/RFC4087, June 2005,
12.2. Informative References


Authors’ Addresses

Yu Fu
CNNIC
No.4 South 4th Street, Zhongguancun
Hai-Dian District, Beijing, 100190
P.R. China

Email: fuyu@cnnic.cn

Sheng Jiang
Huawei Technologies Co., Ltd
Q14, Huawei Campus, No.156 Beiqing Road
Hai-Dian District, Beijing, 100095
P.R. China

Email: jiangsheng@huawei.com

Jiang Dong
Tsinghua University
Department of Computer Science, Tsinghua University
Beijing 100084
P.R. China

Email: knight.dongjiang@gmail.com

Yuchi Chen
Tsinghua University
Department of Computer Science, Tsinghua University
Beijing 100084
P.R. China

Email: flashfoxmx@gmail.com