

MIB for the UDP-Lite Protocol

Status of This Memo

This document specifies an Internet standards track protocol for the Internet community, and requests discussion and suggestions for improvements. Please refer to the current edition of the "Internet Official Protocol Standards" (STD 1) for the standardization state and status of this protocol. Distribution of this memo is unlimited.

Abstract

This document specifies a Management Information Base (MIB) module for the Lightweight User Datagram Protocol (UDP-Lite). It defines a set of new MIB objects to characterise the behaviour and performance of transport layer endpoints deploying UDP-Lite. UDP-Lite resembles UDP, but differs from the semantics of UDP by the addition of a single option. This adds the capability for variable-length data checksum coverage, which can benefit a class of applications that prefer delivery of (partially) corrupted datagram payload data in preference to discarding the datagram.

Table of Contents

1. Introduction	2
1.1. Relationship to the UDP-MIB	2
1.2. Relationship to HOST-RESOURCES-MIB and SYSAPPL-MIB	4
1.3. Interpretation of the MIB Variables	5
1.4. Conventions	8
2. The Internet-Standard Management Framework	8
3. Definitions	8
4. Security Considerations	19
5. IANA Considerations	20
6. Acknowledgments	20
7. References	20
7.1. Normative References	20
7.2. Informative References	21

1. Introduction

The Lightweight User Datagram Protocol (UDP-Lite) [RFC3828] (also known as UDPLite) is an IETF standards-track transport protocol. The operation of UDP-Lite is similar to the User Datagram Protocol (UDP) [RFC768], but can also serve applications in error-prone network environments that prefer to have partially damaged payloads delivered rather than discarded. This is achieved by changing the semantics of the UDP Length field to that of a Checksum Coverage field. If this feature is not used, UDP-Lite is semantically identical to UDP.

The interface of UDP-Lite differs from that of UDP by the addition of a single option, which communicates a length value. At the sender this specifies the intended datagram checksum coverage; at the receiver it signifies a minimum coverage threshold for incoming datagrams. This length value may also be modified during the lifetime of a connection. UDP-Lite does not provide mechanisms to negotiate the checksum coverage between the sender and receiver. Where required, this needs to be communicated by another protocol. The Datagram Congestion Control Protocol (DCCP) [RFC4340] for instance includes a capability to negotiate checksum coverage values.

This document defines a set of runtime statistics (variables) that facilitate network management/monitoring as well as unified comparisons between different protocol implementations and operating environments. To provide a common interface for users and implementors of UDP-Lite modules, the definitions of these runtime statistics are provided as a MIB module using the SMIV2 format [RFC2578].

1.1. Relationship to the UDP-MIB

The similarities between UDP and UDP-Lite suggest that the MIB module for UDP-Lite should resemble that of UDP [RFC4113], with extensions corresponding to the additional capabilities of UDP-Lite. The UDP-Lite MIB module is placed beneath the mib-2 subtree, adhering to the familiar structure of the UDP-MIB module to ease integration.

In particular, these well-known basic counters are supported:

- o InDatagrams
- o NoPorts
- o InErrors
- o OutDatagrams

The following read-only variables have been added to the basic structure used in the UDP-MIB module:

InPartialCov: The number of received datagrams, with a valid format and checksum, whose checksum coverage is strictly less than the datagram length.

InBadChecksum: The number of received datagrams with an invalid checksum (i.e., where the receiver-recalculated UDP-Lite checksum does not match that in the Checksum field). Unlike NoPorts, this error type also counts as InErrors.

OutPartialCov: The number of sent datagrams with a valid format and checksum whose checksum coverage is strictly less than the datagram length.

All non-error counters used in this document are 64-bit counters. This is a departure from UDP, which traditionally used 32-bit counters and mandates 64-bit counters only on fast networks [RFC4113]. This choice is justified by the fact that UDP-Lite is a more recent protocol, and that network speeds continue to grow.

Another difference from the UDP MIB module is that the UDP-Lite MIB module does not support an IPv4-only listener table. This feature was present only for compatibility reasons and is superseded by the more informative endpoint table. Two columnar objects have been added to this table:

udpliteEndpointMinCoverage: The minimum acceptable receiver checksum coverage length [RFC3828]. This value may be manipulated by the application attached to the receiving endpoint.

udpliteEndpointViolCoverage: This object is optional and counts the number of valid datagrams with a checksum coverage value less than the corresponding value of **udpliteEndpointMinCoverage**. Although being otherwise valid, such datagrams are discarded rather than passed to the application. This object thus serves to separate cases of violated coverage from other InErrors.

The second entry is not required to manage the transport protocol and hence is not mandatory. It may be implemented to assist in debugging application design and configuration.

The UDP-Lite MIB module also provides a discontinuity object to help determine whether one or more of its counters experienced a discontinuity event. This is an event, other than re-initialising the management system, that invalidates the management entity's understanding of the counter values.

For example, if UDP-Lite is implemented as a loadable operating system module, a module load or unload would produce a discontinuity. By querying the value of `udpliteStatsDiscontinuityTime`, a management entity can determine whether or not a discontinuity event has occurred.

1.2. Relationship to HOST-RESOURCES-MIB and SYSAPPL-MIB

The UDP-Lite endpoint table contains one columnar object, `udpliteEndpointProcess`, reporting a unique value that identifies a distinct piece of software associated with this endpoint. (When more than one piece of software is associated with this endpoint, a representative is chosen, so that consecutive queries consistently refer to the same identifier. The reported value is then consistent, as long as the representative piece of software is running and still associated with the endpoint.)

The value of `udpliteEndpointProcess` is reported as an `Unsigned32`, and it shares with the `hrSWRunIndex` of the HOST-RESOURCES-MIB [RFC2790] and the `sysAppElmtRunIndex` of the SYSAPPL-MIB [RFC2287] the requirement that, wherever possible, this should be the native and unique identification number employed by the system.

If the SYSAPPL-MIB module is available, the value of `udpliteEndpointProcess` should correspond to the appropriate value of `sysAppElmtRunIndex`. If not available, an alternative should be used (e.g., the `hrSWRunIndex` of the HOST-RESOURCES-MIB module).

1.3. Interpretation of the MIB Variables

Figure 1 shows an informal survey of the packet processing path, with reference to counter names in parentheses.

Received UDP-Lite Datagrams

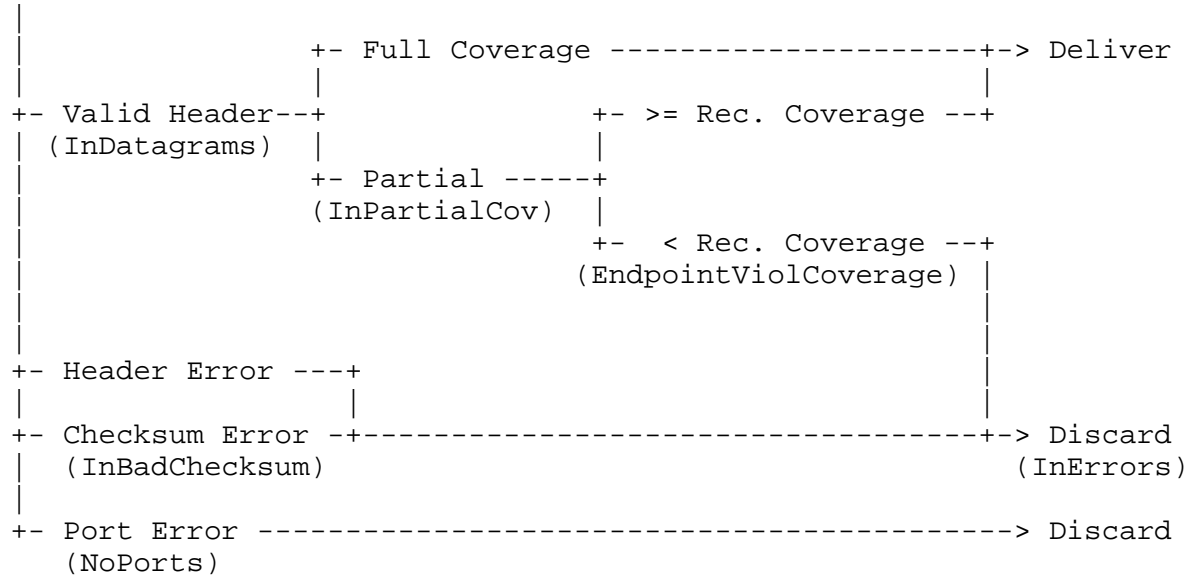


Figure 1: UDP-Lite Input Processing Path

A platform-independent test of the UDP-Lite implementations in two connected end hosts may be performed as follows.

On the sending side, OutDatagrams and OutPartialCov are observed. The ratio OutPartialCov/OutDatagrams describes the fraction (between 0 and 1) of datagrams using partial checksum coverage.

On the receiving side, InDatagrams, InPartialCov, and InErrors are monitored. If datagrams are received from the given sender, InErrors is close to zero, and InPartialCov is zero, no partial coverage is employed. If no datagrams are received and InErrors increases proportionally with the sending rate, a configuration error is likely (a wrong value of receiver minimum checksum coverage).

The InBadChecksum counter reflects errors that may persist following end-host processing, router processing, or link processing (this includes illegal coverage values as defined in [RFC3828], since checksum and checksum coverage are mutually interdependent). In particular, InBadChecksum can serve as an indicator of the residual

link bit error rate: on links with higher bit error rates, a lower value of the checksum coverage may help to reduce the values of both InErrors and InBadChecksum. By observing these values and adapting the configuration, a setting may then be found that is more adapted to the specific type of link, and the type of payload. In particular, a reduction in the number of discarded datagrams (InErrors), may indicate an improved performance.

The above statistics are elementary and can be used to derive the following information:

- o The total number of incoming datagrams is $\text{InDatagrams} + \text{InErrors} + \text{NoPorts}$.
- o The number of InErrors that were discarded due to problems other than a bad checksum is $\text{InErrors} - \text{InBadChecksum}$.
- o The number of InDatagrams that have full coverage is $\text{InDatagrams} - \text{InPartialCov}$.
- o The number of OutDatagrams that have full coverage is $\text{OutDatagrams} - \text{OutPartialCov}$.

The following Case diagram [CASE] summarises the relationships between the counters on the input processing path.

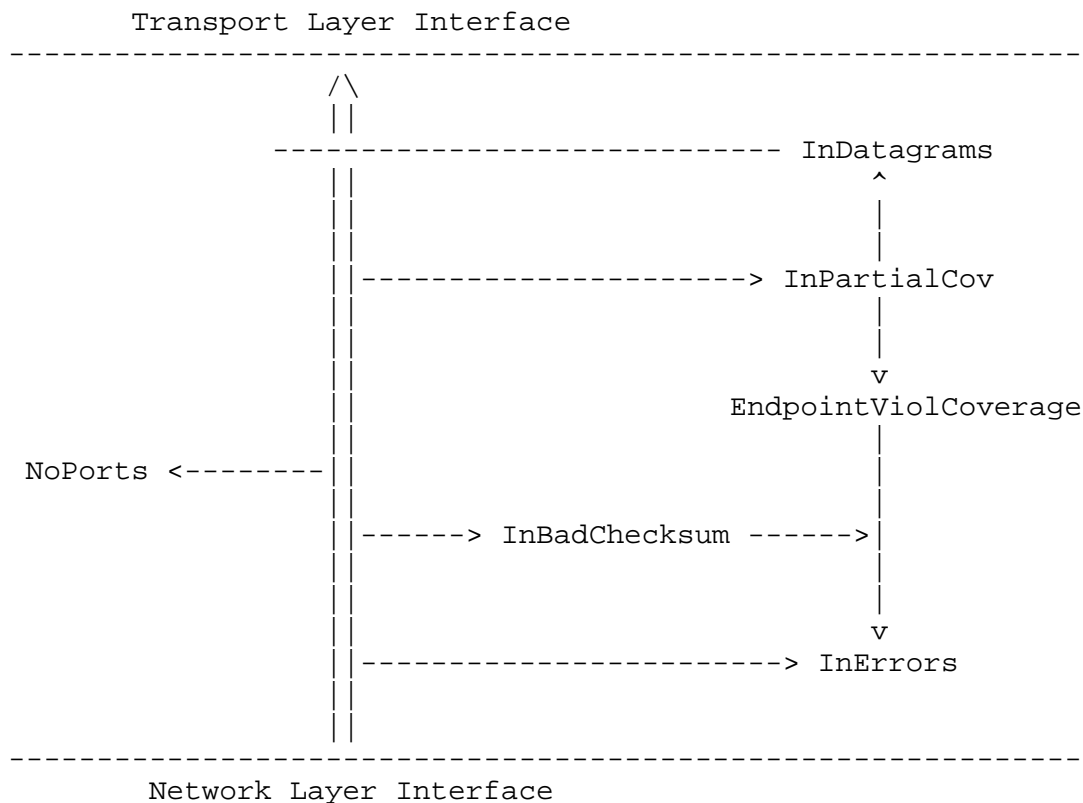


Figure 2: Counters for Received UDP-Lite Datagrams

A configuration error may occur when a sender chooses a coverage value for the datagrams that it sends that is less than the minimum coverage configured by the intended recipient. The minimum coverage is set on a per-session basis by the application associated with the listening endpoint, and its current value is recorded in the `udpliteEndpointTable`. Reception of valid datagrams with a checksum coverage value less than this threshold results in dropping the datagram [RFC3828] and incrementing `InErrors`. To improve debugging of such (misconfigured) cases, an implementer may choose to support the optional `udpliteEndpointViolCoverage` entry in the endpoint table (Section 1.1) that specifically counts datagrams falling in this category. Without this feature, failure due to misconfiguration can not be distinguished from datagram processing failure.

1.4. Conventions

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in BCP 14 [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

```
UDPLITE-MIB DEFINITIONS ::= BEGIN
```

```
IMPORTS
```

```
    MODULE-IDENTITY,
    OBJECT-TYPE,
    mib-2, Unsigned32,
    Counter32, Counter64      FROM SNMPv2-SMI                -- [RFC2578]

    TimeStamp                FROM SNMPv2-TC                  -- [RFC2579]

    MODULE-COMPLIANCE,
    OBJECT-GROUP              FROM SNMPv2-CONF                -- [RFC2580]

    InetAddress,
    InetAddressType,
    InetPortNumber            FROM INET-ADDRESS-MIB;          -- [RFC4001]
```

```
udpliteMIB MODULE-IDENTITY
```

```
    LAST-UPDATED "200712180000Z"          -- 18 December 2007
    ORGANIZATION "IETF TSV Working Group (TSVWG)"
    CONTACT-INFO
        "IETF TSV Working Group
        http://www.ietf.org/html.charters/tsvwg-charter.html
        Mailing List: tsvwg@ietf.org
```


Gerrit Renker, Godred Fairhurst
Electronics Research Group
School of Engineering, University of Aberdeen
Fraser Noble Building, Aberdeen AB24 3UE, UK"

DESCRIPTION

"The MIB module for managing UDP-Lite implementations.
Copyright (C) The IETF Trust (2008). This version of
this MIB module is part of RFC 5097; see the RFC
itself for full legal notices."

REVISION "200712180000Z"

-- 18 December 2007

DESCRIPTION

"Initial SMIV2 revision, based on the format of the UDP
MIB module (RFC 4113) and published as RFC 5097."

::= { mib-2 170 }

udplite OBJECT IDENTIFIER ::= { udpliteMIB 1 }

udpliteInDatagrams OBJECT-TYPE -- as in UDP-MIB

SYNTAX Counter64

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The total number of UDP-Lite datagrams that were
delivered to UDP-Lite users.
Discontinuities in the value of this counter can occur
at re-initialisation of the management system, and at
other times as indicated by the value of
udpliteStatsDiscontinuityTime."

::= { udplite 1 }

udpliteInPartialCov OBJECT-TYPE -- new in UDP-Lite

SYNTAX Counter64

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The total number of UDP-Lite datagrams that were
delivered to UDP-Lite users (applications) and whose
checksum coverage was strictly less than the datagram
length.
Discontinuities in the value of this counter can occur
at re-initialisation of the management system, and at
other times as indicated by the value of
udpliteStatsDiscontinuityTime."

::= { udplite 2 }

```
udpliteNoPorts OBJECT-TYPE                -- as in UDP-MIB
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The total number of received UDP-Lite datagrams for
        which there was no listener at the destination port.
        Discontinuities in the value of this counter can occur
        at re-initialisation of the management system, and at
        other times as indicated by the value of
        udpliteStatsDiscontinuityTime."
    ::= { udplite 3 }

udpliteInErrors OBJECT-TYPE                -- as in UDP-MIB
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of received UDP-Lite datagrams that could not
        be delivered for reasons other than the lack of an
        application at the destination port.
        Discontinuities in the value of this counter can occur
        at re-initialisation of the management system, and at
        other times as indicated by the value of
        udpliteStatsDiscontinuityTime."
    ::= { udplite 4 }

udpliteInBadChecksum OBJECT-TYPE           -- new in UDP-Lite
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of received UDP-Lite datagrams whose checksum
        could not be validated. This includes illegal checksum
        coverage values, as their use would lead to incorrect
        checksums.
        Discontinuities in the value of this counter can occur
        at re-initialisation of the management system, and at
        other times as indicated by the value of
        udpliteStatsDiscontinuityTime."
    REFERENCE  "RFC 3828, section 3.1"
    ::= { udplite 5 }

udpliteOutDatagrams OBJECT-TYPE            -- as in UDP-MIB
    SYNTAX      Counter64
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
```

"The total number of UDP-Lite datagrams sent from this entity.
Discontinuities in the value of this counter can occur at re-initialisation of the management system, and at other times as indicated by the value of udpliteStatsDiscontinuityTime."

::= { udplite 6 }

udpliteOutPartialCov OBJECT-TYPE -- new in UDP-Lite

SYNTAX Counter64

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The total number of udpliteOutDatagrams whose checksum coverage was strictly less than the datagram length.

Discontinuities in the value of this counter can occur at re-initialisation of the management system, and at other times as indicated by the value of udpliteStatsDiscontinuityTime."

::= { udplite 7 }

udpliteEndpointTable OBJECT-TYPE

SYNTAX SEQUENCE OF UdpLiteEndpointEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"A table containing information about this entity's UDP-Lite endpoints on which a local application is currently accepting or sending datagrams.

The address type in this table represents the address type used for the communication, irrespective of the higher-layer abstraction. For example, an application using IPv6 'sockets' to communicate via IPv4 between ::ffff:10.0.0.1 and ::ffff:10.0.0.2 would use InetAddressType ipv4(1).

Like the udpTable in RFC 4113, this table also allows the representation of an application that completely specifies both local and remote addresses and ports. A listening application is represented in three possible ways:

- 1) An application that is willing to accept both IPv4 and IPv6 datagrams is represented by a udpliteEndpointLocalAddressType of unknown(0) and a udpliteEndpointLocalAddress of ''h (a zero-length

octet-string).

- 2) An application that is willing to accept only IPv4 or only IPv6 datagrams is represented by a `udpliteEndpointLocalAddressType` of the appropriate address type and a `udpliteEndpointLocalAddress` of '0.0.0.0' or ':::' respectively.
- 3) An application that is listening for datagrams only for a specific IP address but from any remote system is represented by a `udpliteEndpointLocalAddressType` of the appropriate address type, with `udpliteEndpointLocalAddress` specifying the local address.

In all cases where the remote address is a wildcard, the `udpliteEndpointRemoteAddressType` is `unknown(0)`, the `udpliteEndpointRemoteAddress` is ''h (a zero-length octet-string), and the `udpliteEndpointRemotePort` is 0.

If the operating system is demultiplexing UDP-Lite packets by remote address/port, or if the application has 'connected' the socket specifying a default remote address/port, the `udpliteEndpointRemote*` values should be used to reflect this."

::= { udplite 8 }

`udpliteEndpointEntry` OBJECT-TYPE

SYNTAX `UdpLiteEndpointEntry`

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"Information about a particular current UDP-Lite endpoint. Implementers need to pay attention to the sizes of `udpliteEndpointLocalAddress/RemoteAddress`, as Object Identifiers (OIDs) of column instances in this table must have no more than 128 sub-identifiers in order to remain accessible with SNMPv1, SNMPv2c, and SNMPv3."

INDEX { `udpliteEndpointLocalAddressType`,
`udpliteEndpointLocalAddress`,
`udpliteEndpointLocalPort`,
`udpliteEndpointRemoteAddressType`,
`udpliteEndpointRemoteAddress`,
`udpliteEndpointRemotePort`,
`udpliteEndpointInstance` }

::= { udpliteEndpointTable 1 }

`UdpLiteEndpointEntry` ::= SEQUENCE {

```

    udpliteEndpointLocalAddressType      InetAddressType,
    udpliteEndpointLocalAddress          InetAddress,
    udpliteEndpointLocalPort              InetPortNumber,
    udpliteEndpointRemoteAddressType      InetAddressType,
    udpliteEndpointRemoteAddress          InetAddress,
    udpliteEndpointRemotePort              InetPortNumber,
    udpliteEndpointInstance                Unsigned32,
    udpliteEndpointProcess                  Unsigned32,
    udpliteEndpointMinCoverage              Unsigned32,
    udpliteEndpointViolCoverage            Counter32
}

udpliteEndpointLocalAddressType OBJECT-TYPE
    SYNTAX      InetAddressType
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The address type of udpliteEndpointLocalAddress. Only
        IPv4, IPv4z, IPv6, and IPv6z addresses are expected, or
        unknown(0) if datagrams for all local IP addresses are
        accepted."
    ::= { udpliteEndpointEntry 1 }

```

```

udpliteEndpointLocalAddress OBJECT-TYPE
    SYNTAX      InetAddress
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The local IP address for this UDP-Lite endpoint.

        The value of this object can be represented in three
        possible ways, depending on the characteristics of the
        listening application:

        1. For an application that is willing to accept both
           IPv4 and IPv6 datagrams, the value of this object
           must be ''h (a zero-length octet-string), with
           the value of the corresponding instance of the
           EndpointLocalAddressType object being unknown(0).

        2. For an application that is willing to accept only
           IPv4 or only IPv6 datagrams, the value of this
           object must be '0.0.0.0' or ':::', respectively,
           while the corresponding instance of the
           EndpointLocalAddressType object represents the
           appropriate address type.

        3. For an application that is listening for data

```

destined only to a specific IP address, the value of this object is the specific IP address for which this node is receiving packets, with the corresponding instance of the EndpointLocalAddressType object representing the appropriate address type.

As this object is used in the index for the udpliteEndpointTable, implementors should be careful not to create entries that would result in OIDs with more than 128 sub-identifiers; this is because of SNMP and SMI limitations."

```
::= { udpliteEndpointEntry 2 }
```

udpliteEndpointLocalPort OBJECT-TYPE

SYNTAX InetPortNumber

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"The local port number for this UDP-Lite endpoint."

```
::= { udpliteEndpointEntry 3 }
```

udpliteEndpointRemoteAddressType OBJECT-TYPE

SYNTAX InetAddressType

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"The address type of udpliteEndpointRemoteAddress. Only IPv4, IPv4z, IPv6, and IPv6z addresses are expected, or unknown(0) if datagrams for all remote IP addresses are accepted. Also, note that some combinations of udpliteEndpointLocalAdressType and udpliteEndpointRemoteAddressType are not supported. In particular, if the value of this object is not unknown(0), it is expected to always refer to the same IP version as udpliteEndpointLocalAddressType."

```
::= { udpliteEndpointEntry 4 }
```

udpliteEndpointRemoteAddress OBJECT-TYPE

SYNTAX InetAddress

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"The remote IP address for this UDP-Lite endpoint. If datagrams from any remote system are to be accepted, this value is ''h (a zero-length octet-string).

Otherwise, it has the type described by

udpliteEndpointRemoteAddressType and is the address of

the remote system from which datagrams are to be accepted (or to which all datagrams will be sent).

As this object is used in the index for the `udpliteEndpointTable`, implementors should be careful not to create entries that would result in OIDs with more than 128 sub-identifiers; this is because of SNMP and SMI limitations."

::= { udpliteEndpointEntry 5 }

`udpliteEndpointRemotePort` OBJECT-TYPE

SYNTAX InetPortNumber

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"The remote port number for this UDP-Lite endpoint. If datagrams from any remote system are to be accepted, this value is zero."

::= { udpliteEndpointEntry 6 }

`udpliteEndpointInstance` OBJECT-TYPE

SYNTAX Unsigned32 (1..'ffffffff'h)

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"The instance of this tuple. This object is used to distinguish among multiple processes 'connected' to the same UDP-Lite endpoint. For example, on a system implementing the BSD sockets interface, this would be used to support the `SO_REUSEADDR` and `SO_REUSEPORT` socket options."

::= { udpliteEndpointEntry 7 }

`udpliteEndpointProcess` OBJECT-TYPE

SYNTAX Unsigned32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"A unique value corresponding to a piece of software running on this endpoint.

If this endpoint is associated with more than one piece of software, the agent should choose one of these. As long as the representative piece of software is running and still associated with the endpoint, subsequent reads will consistently return the same value. The implementation may use any algorithm satisfying these constraints (e.g., choosing the entity

with the oldest start time).

This identifier is platform-specific. Wherever possible, it should use the system's native, unique identification number as the value.

If the SYSAPPL-MIB module is available, the value should be the same as sysAppElmtRunIndex. If not available, an alternative should be used (e.g., the hrSWRunIndex of the HOST-RESOURCES-MIB module).

If it is not possible to uniquely identify the pieces of software associated with this endpoint, then the value zero should be used. (Note that zero is otherwise a valid value for sysAppElmtRunIndex.)"

::= { udpliteEndpointEntry 8 }

udpliteEndpointMinCoverage OBJECT-TYPE -- new in UDP-Lite

SYNTAX Unsigned32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The minimum checksum coverage expected by this endpoint. A value of 0 indicates that only fully covered datagrams are accepted."

REFERENCE "RFC 3828, section 3.1"

::= { udpliteEndpointEntry 9 }

udpliteEndpointViolCoverage OBJECT-TYPE -- new / optional in UDP-Lite

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of datagrams received by this endpoint whose checksum coverage violated the minimum coverage threshold set for this connection (i.e., all valid datagrams whose checksum coverage was strictly smaller than the minimum, as defined in RFC 3828).

Discontinuities in the value of this counter can occur at re-initialisation of the management system, and at other times as indicated by the value of udpliteStatsDiscontinuityTime."

::= { udpliteEndpointEntry 10 }


```
udpliteStatsDiscontinuityTime OBJECT-TYPE
    SYNTAX      TimeStamp
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The value of sysUpTime at the most recent occasion at
        which one or more of the UDP-Lite counters suffered a
        discontinuity.
        A value of zero indicates no such discontinuity has
        occurred since the last re-initialisation of the local
        management subsystem."
    ::= { udplite 9 }
```

```
-- Conformance Information
```

```
udpliteMIBConformance OBJECT IDENTIFIER ::= { udpliteMIB 2 }
```

```
udpliteMIBCompliance MODULE-COMPLIANCE
    STATUS      current
    DESCRIPTION
        "The compliance statement for systems that implement
        UDP-Lite.

        There are a number of INDEX objects that cannot be
        represented in the form of OBJECT clauses in SMIV2,
        but for which we have the following compliance
        requirements, expressed in OBJECT clause form in this
        description clause:
```

```
-- OBJECT      udpliteEndpointLocalAddressType
-- SYNTAX      InetAddressType { unknown(0), ipv4(1),
--                               ipv6(2), ipv4z(3),
--                               ipv6z(4) }
-- DESCRIPTION
--     Support for dns(16) is not required.
-- OBJECT      udpliteEndpointLocalAddress
-- SYNTAX      InetAddress (SIZE(0|4|8|16|20))
-- DESCRIPTION
--     Support is only required for zero-length
--     octet-strings, and for scoped and unscoped
--     IPv4 and IPv6 addresses.
-- OBJECT      udpliteEndpointRemoteAddressType
-- SYNTAX      InetAddressType { unknown(0), ipv4(1),
--                               ipv6(2), ipv4z(3),
--                               ipv6z(4) }
-- DESCRIPTION
--     Support for dns(16) is not required.
-- OBJECT      udpliteEndpointRemoteAddress
```

```

-- SYNTAX      InetAddress (SIZE(0|4|8|16|20))
-- DESCRIPTION
--      Support is only required for zero-length
--      octet-strings, and for scoped and unscoped
--      IPv4 and IPv6 addresses.
"
MODULE -- this module
    MANDATORY-GROUPS { udpliteBaseGroup,
                        udplitePartialCsumGroup,
                        udpliteEndpointGroup }
    GROUP          udpliteAppGroup
    DESCRIPTION
        "This group is optional and provides supplementary
        information about the effectiveness of using minimum
        checksum coverage thresholds on endpoints."
    ::= { udpliteMIBConformance 1 }

udpliteMIBGroups OBJECT IDENTIFIER ::= { udpliteMIBConformance 2 }

udpliteBaseGroup OBJECT-GROUP          -- as in UDP
    OBJECTS      { udpliteInDatagrams, udpliteNoPorts, udpliteInErrors,
                  udpliteOutDatagrams, udpliteStatsDiscontinuityTime }
    STATUS      current
    DESCRIPTION
        "The group of objects providing for counters of
        basic UDP-like statistics."
    ::= { udpliteMIBGroups 1 }

udplitePartialCsumGroup OBJECT-GROUP -- specific to UDP-Lite
    OBJECTS      { udpliteInPartialCov,
                  udpliteInBadChecksum,
                  udpliteOutPartialCov }
    STATUS      current
    DESCRIPTION
        "The group of objects providing for counters of
        transport layer statistics exclusive to UDP-Lite."
    ::= { udpliteMIBGroups 2 }

udpliteEndpointGroup OBJECT-GROUP
    OBJECTS      { udpliteEndpointProcess, udpliteEndpointMinCoverage }
    STATUS      current
    DESCRIPTION
        "The group of objects providing for the IP version
        independent management of UDP-Lite 'endpoints'."
    ::= { udpliteMIBGroups 3 }

```

```
udpliteAppGroup OBJECT-GROUP
    OBJECTS      { udpliteEndpointViolCoverage }
    STATUS       current
    DESCRIPTION   "The group of objects that provide application-level
                  information for the configuration management of
                  UDP-Lite 'endpoints'."
    ::= { udpliteMIBGroups 4 }

END
```

4. Security Considerations

There are no management objects defined in this MIB module that have a MAX-ACCESS clause of read-write and/or read-create. So, if this MIB module is implemented correctly, then there is no risk that an intruder can alter or create any management objects of this MIB module via direct SNMP SET operations.

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:

The indices of the udpliteEndpointTable contain information about the listeners on an entity. In particular, the udpliteEndpointLocalPort index objects can be used to identify ports that are open on the machine and which attacks are likely to succeed, without the attacker having to run a port scanner. The table also identifies the currently listening UDP-Lite ports.

The udpliteEndpointMinCoverage provides information about the requirements of the transport service associated with a specific UDP-Lite port. This provides additional detail concerning the type of application associated with the port at the receiver.

Since UDP-Lite permits the delivery of (partially) corrupted data to an end host, the counters defined in this MIB module may be used to infer information about the characteristics of the end-to-end path over which the datagrams are communicated. This information could be used to infer the type of application associated with the port at the receiver.

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.

It is RECOMMENDED that implementers consider the security features as provided by the SNMPv3 framework (see RFC 3410 [RFC3410], section 8), including full support for the SNMPv3 cryptographic mechanisms (for authentication and privacy).

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.

5. IANA Considerations

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

+	-----+	-----+	+
	Descriptor		OBJECT IDENTIFIER value
+	-----+	-----+	+
	udpliteMIB		{ mib-2 170 }
+	-----+	-----+	+

6. Acknowledgments

The design of the MIB module presented in this document owes much to the format of the module presented in [RFC4113].

7. References

7.1. 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 SMIV2", STD 58, RFC 2580, April 1999.
- [RFC3828] Larzon, L-A., Degermark, M., Pink, S., Jonsson, L-E., and G. Fairhurst, "The Lightweight User Datagram Protocol (UDP-Lite)", RFC 3828, July 2004.
- [RFC4001] Daniele, M., Haberman, B., Routhier, S., and J. Schoenwaelder, "Textual Conventions for Internet Network Addresses", RFC 4001, February 2005.

7.2. Informative References

- [CASE] Case, J. and C. Partridge, "Case Diagrams: A First Step to Diagrammed Management Information Bases", ACM Computer Communications Review, 19(1):13-16, January 1989.
- [RFC768] Postel, J., "User Datagram Protocol", STD 6, RFC 768, August 1980.
- [RFC2287] Krupczak, C. and J. Saperia, "Definitions of System-Level Managed Objects for Applications", RFC 2287, February 1998.
- [RFC2790] Waldbusser, S. and P. Grillo, "Host Resources MIB", RFC 2790, March 2000.
- [RFC3410] Case, J., Mundy, R., Partain, D., and B. Stewart, "Introduction and Applicability Statements for Internet-Standard Management Framework", RFC 3410, December 2002.
- [RFC4113] Fenner, B. and J. Flick, "Management Information Base for the User Datagram Protocol (UDP)", RFC 4113, June 2005.
- [RFC4340] Kohler, E., Handley, M., and S. Floyd, "Datagram Congestion Control Protocol (DCCP)", RFC 4340, March 2006.

Authors' Addresses

Gerrit Renker
University of Aberdeen
School of Engineering
Fraser Noble Building
Aberdeen AB24 3UE
Scotland

EMail: gerrit@erg.abdn.ac.uk
URI: <http://www.erg.abdn.ac.uk>

Godred Fairhurst
University of Aberdeen
School of Engineering
Fraser Noble Building
Aberdeen AB24 3UE
Scotland

EMail: gorry@erg.abdn.ac.uk
URI: <http://www.erg.abdn.ac.uk>

Full Copyright Statement

Copyright (C) The IETF Trust (2008).

This document is subject to the rights, licenses and restrictions contained in BCP 78, and except as set forth therein, the authors retain all their rights.

This document and the information contained herein are provided on an "AS IS" basis and THE CONTRIBUTOR, THE ORGANIZATION HE/SHE REPRESENTS OR IS SPONSORED BY (IF ANY), THE INTERNET SOCIETY, THE IETF TRUST AND THE INTERNET ENGINEERING TASK FORCE DISCLAIM ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY WARRANTY THAT THE USE OF THE INFORMATION HEREIN WILL NOT INFRINGE ANY RIGHTS OR ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

Intellectual Property

The IETF takes no position regarding the validity or scope of any Intellectual Property Rights or other rights that might be claimed to pertain to the implementation or use of the technology described in this document or the extent to which any license under such rights might or might not be available; nor does it represent that it has made any independent effort to identify any such rights. Information on the procedures with respect to rights in RFC documents can be found in BCP 78 and BCP 79.

Copies of IPR disclosures made to the IETF Secretariat and any assurances of licenses to be made available, or the result of an attempt made to obtain a general license or permission for the use of such proprietary rights by implementers or users of this specification can be obtained from the IETF on-line IPR repository at <http://www.ietf.org/ipr>.

The IETF invites any interested party to bring to its attention any copyrights, patents or patent applications, or other proprietary rights that may cover technology that may be required to implement this standard. Please address the information to the IETF at ietf-ipr@ietf.org.

