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MIB for the UDP-Lite protocol
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Status of this Memo

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Abstract

This document specifies a Management Information Base (MIB) module for the Lightweight User Datagram Protocol. 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.

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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) [RFC0768], 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. DCCP [RFC4340] for instance includes a capability to negotiate checksum coverage values.

This document defines a set of runtime statistics (variables) that facilitate both 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:

- InDatagrams
- NoPorts
- InErrors
- 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, which 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 which 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, 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 sysApplElmtRunIndex 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 sysApplElmtRunIndex. 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 brackets.

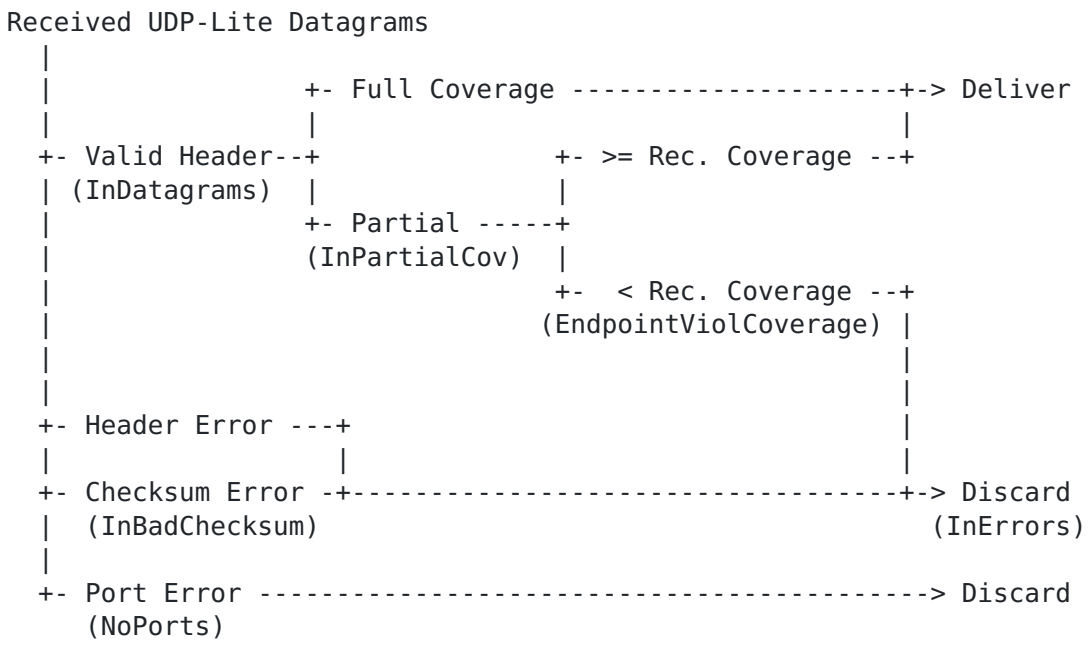

Figure 1: UDP-Lite Input Processing Path

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 inter-dependent). 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 both the values of 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, as well as the type of payload; indicated by a reduction of the

number of discarded datagrams (InErrors), leading to an improved performance.

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

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

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

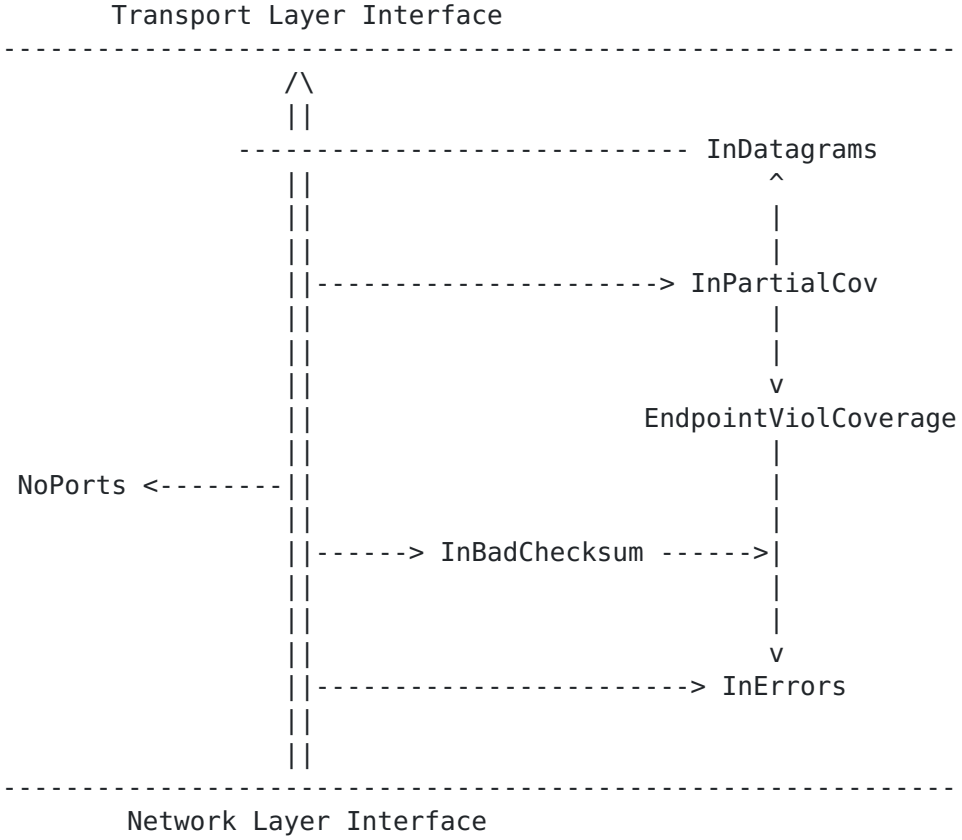

Figure 2: Counters for received UDP-Lite Datagrams

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 "200710290000Z"       -- Mon, 29th Oct 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 (2007). This version of
               this MIB module is part of RFC ZZZ; see the RFC
               itself for full legal notices."

       -- RFC Ed.: replace ZZZ with actual RFC number & remove this note

       REVISION "200710290000Z"           -- Mon, 29th Oct 2007
       DESCRIPTION
              "Initial SMIv2 revision, based on the format of the UDP
               MIB module (RFC 4113) and published as RFC ZZZ."

       -- RFC Ed.: replace ZZZ with actual RFC number & remove this note

       ::= { mib-2 XXX }

       -- RFC Ed.: replace XXX with OBJECT-IDENTIFIER & remove this note


   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 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; such
               that subsequent reads will consistently return the same
               value, as long as the representative piece of software
               is running and still associated with the endpoint. 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 value.

               If the SYSAPPL-MIB module is available, the value should
               be the same as sysApplElmtRunIndex. 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 sysApplElmtRunIndex.)"
       ::= { 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:

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.

The indices of the udpliteEndpointTable contain information about the listeners on an entity. In particular, the udpliteEndpointLocalPort and udpliteLocalPort objects in the indices can be used to identify what ports 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. This could be used to infer the type of application associated with the port at the receiver. 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.

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 XXX }

==> Note to the RFC Editor (to be removed prior to publication):

The IANA is requested to assign a value for "XXX" under the 'mib-2' subtree and to record the assignment in the SMI Numbers registry. When the assignment has been made, the RFC Editor is asked to replace "XXX" (here and in the MIB module) with the assigned value and to remove this note.

6. Acknowledgments

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

==> NOTE TO THE RFC EDITOR: PLEASE REMOVE THIS LOG PRIOR TO PUBLICATION

Revision 00 of draft-ietf-tsvwg-udplite-mib was obsoleted by revision 01 due to a syntax error (quote transposed with full-stop) in the MIB module, which is corrected in rev-01. Thanks to Magnus Westerlund for identifying this.

Draft draft-ietf-tsvwg-udplite-mib-00 was published as a work item of tsvwg, June 2007.

The following changelog lists the changes up to revision 02 (which became rev-00/01 of this document) of the preceding individual draft submission draft-renker-tsvwg-udplite-mib.

Changes introduced in rev-01:

- General:
  - incremented revision number to 01
  - updated date to November
  - rephrased abstract
- Section 1:
  - rephrased the beginning of the second paragraph
- Section 1.1:
  - rephrased some items
  - added missing InBadChecksum heading
  - updated text to refer to 64bit counters
- Section 1.3:
  - removed 'x' in 'datagrams'
  - rephrased for clarity
  - Figure 1: missing bracketed text should be InErrors
  - Figure 1: correction - NoPorts are not counted as InDatagrams

- Section 2:

  - made the "Editor's Note" stand out more

- Section 3 / MIB:

  - upgraded 11 32bit counters to 64bit

  - moved from experimental to mib-2

  - updated revision date

- Section 4:

  - some minor changes

- Section 5:

  - again highlighted the Editor's Note by using `==>' to make it consistent

Changes introduced in rev-02:

- General:

  - updated month, date, and revision

  - changed `transport layer entities' to `endpoints' in abstract

- Section 1:

  - added missing comma after `option'

  - split explanatory clause after colon into standalone clause

- Section 1.1:

  - added a bullet list of standard counters known from the UDP MIB

  - added a note that NoPorts does not increment InErrors

  - removed description of InBadCoverage (no longer in MIB, see below)

  - qualified note with on 64-bit counters wrt `non-error' counters, reflecting the change that all error counters have been changed to Counter32

- Nit: changed `fairly recent' -> `more recent'

- removed traces of InBadCoverage (see below)

o Section 1.3:

- corrected figure 1 (NoPorts was inconsistent with text; Rec Coverage was incorrectly labelled, it didn't show EndpointViolCoverage; slight reformatting)

- Nit: `wrong value' -> `a wrong value'

- clarified that InBadChecksum can also serve as indicator of path bit error rate

- Nit: `which' -> `that' in `a setting may then ...' and `A configuration error may ...'

- removed traces of InBadCoverage (see below)

o Section 3 (the MIB):

- updated LAST-UPDATED and REVISION to match the revision date

- updated the Copyright in DESCRIPTION from 2006 to 2007

- converted all error counters to Counter32, following IETF input for rev-01

- added a required IMPORTS statement for Counter32 to UDPLITE-MIB DEFINITIONS

- demoted the following error counters from Counter64 to Counter32: udpliteNoPorts, udpliteInErrors, updliteInBadChecksum, udpliteEndpointViolCoverage

- removed second, redundant MIB-2 number of udplite, following suggestion by Bill Fenner.

- updated warning about maximum number of sub-identifiers in udpliteEndpointEntry, to reflect new structure

- udplite now comes as entry number 1 in the udpliteMIB tree

- accordingly changed the identifier of udpliteMIBConformance to 2

- updated all RFC editor notes with regard to the assignment of mib-2 identifier numbers (now only a single one required)

- updated section `IANA Considerations' with regard to this change

- removed the InBadCoverage counter since it is subsumed by InBadChecksum (see below)

- updated the following identifier numbers for consistency after removal: udpliteInBadChecksum (6 -> 5), udpliteOutDatagrams (7 -> 6), udpliteOutPartialCov (8 -> 7), udpliteEndpointTable (9 -> 8)

- removed udpliteInBadCoverage from udplitePartialCsumGroup

- extended the definition of InBadChecksum to include invalid checksum coverage

- added RFC 3828 references for udpliteEndpointMinCoverage and udpliteEndpointViolCoverage

- updated the description of udpliteEndpointInstance with respect to draft-persson-v6ops-mib-issue-01.txt, section 3.2

o Section 7 (References):

- RFC 4113 (UDP MIB) becomes informative, not normative

o Note on the removal of InBadCoverage: Following rev-01, this counter has been removed since - with the exception of obviously buggy UDP-Lite stacks - it is subsumed by InBadChecksum. An illegal checksum value which is not the cause of a buggy implementation will in practically all cases lead to an incorrect checksum value, so that one counter implies information inherent in the other.

====> END OF NOTE TO THE RFC EDITOR <====

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.

[RFC0768] 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.

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