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Definition of Managed Objects for the Lightweight On-demand Ad hoc
Distance-vector Routing Protocol - Next Generation (LOADng)
draft-herberg-lln-loadng-mib-01

Abstract

This memo defines a portion of the Management Information Base (MIB) for use with network management protocols in the Internet community. In particular, it describes objects for configuring parameters of the Lightweight On-demand Ad hoc Distance-vector Routing Protocol - Next Generation (LOADng) process on a router. The MIB module defined in this memo, denoted LOADng-MIB, also reports state. While LOADng is layer agnostic and can be run with different address families (e.g., on L2 using MAC addresses, or on L3 using IP addresses), this MIB module assumes that LOADng is used on L3, and uses only IPv4/IPv6 addresses.

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The LOADng-MIB

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[1.](#) Introduction

This memo defines a portion of the Management Information Base (MIB) for use with network management protocols in the Internet community. In particular, it describes objects for configuring parameters of the Lightweight On-demand Ad hoc Distance-vector Routing Protocol - Next Generation (LOADng) [[LOADng](#)] process on a router. The MIB module defined in this memo, denoted LOADng-MIB, also reports state. While LOADng is layer agnostic and can be run with different address families (e.g., on L2 using MAC addresses, or on L3 using IP addresses), this MIB module assumes that LOADng is used on L3, and uses only IPv4/IPv6 addresses.

[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 SMIV2, which is described in STD 58, [RFC 2578](#) [[RFC2578](#)], STD 58, [RFC 2579](#) [[RFC2579](#)] and STD 58, [RFC 2580](#) [[RFC2580](#)].

[3.](#) Conventions

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](#)].

[4.](#) Overview

The Lightweight On-demand Ad hoc Distance-vector Routing Protocol - Next Generation (LOADng) [[LOADng](#)] is a routing protocol, derived from AODV [[RFC3561](#)] and extended for use in Mobile Ad Hoc Networks (MANETs). As a reactive protocol, the basic operations of LOADng include generation of Route Requests (RREQs) by a router (originator) for when discovering a route to a destination, forwarding of such RREQs until they reach the destination router, generation of Route Replies (RREPs) upon receipt of an RREQ by the indicated destination, and unicast hop-by-hop forwarding of these RREPs towards the originator. If a route is detected broken, i.e., if forwarding of a data packet to the recorded next hop on the route to the destination

is detected to fail, a Route Error (RERR) message is returned in unicast to the originator of that data packet.

This MIB module describes objects for configuring parameters of a LOADng process on a router, as well as for the relevant state of a LOADng process on a router, in order to monitor and manage parameters and information bases of LOADng.

[4.1.](#) Terms

The following definitions apply throughout this document:

- o Configuration Objects - switches, tables, objects which are initialized to default settings or set through the management interface defined by this MIB module.
- o State Objects - automatically generated values which define the current operating state of the LOADng protocol process in the router.

[5.](#) Structure of the MIB Module

This section presents the structure of the LOADng-MIB module. The MIB module is arranged into the following structure:

- o LOADngObjects - defining objects within this MIB module. The objects are arranged into the following groups:
 - * Configuration Group - defining objects related to the

configuration of the LOADng instance on the router.

- * State Group - defining objects which reflect the current state of the LOADng instance running on the router.
- o LOADngConformance - defining the minimal and maximal conformance requirements for implementations of this MIB module.

[5.1.](#) The Configuration Group

The LOADng router is configured with a set of controls. The authoritative list of configuration controls within the LOADng-MIB module are found within the MIB module itself. Generally, an attempt was made in developing the LOADng-MIB module to support all configuration objects defined in [[LOADng](#)]. For all of the configuration parameters, the same default values of these parameters as defined in [[LOADng](#)] are followed.

[5.2.](#) The State Group

The State Group reports current state information of a router running [[LOADng](#)]. The LOADng-MIB State Group tables were designed to contain the complete set of state information defined within the information bases specified in Section 6 of [[LOADng](#)].

[5.3.](#) Tables and Indexing

The LOADng-MIB module contains a number of tables which record data related to:

- o the local LOADng router,
- o a local LOADng interface on the LOADng router,
- o other LOADng routers in the routing domain.

The LOADng-MIB module's tables and their indexing are:

- o loadngInterfaceTable - describes the configuration of the interfaces of this LOADng router. This table has INDEX {

loadngIfIndex }.

- o loadngLibLocalIfSetTable - records all network addresses which are defined as local interface network addresses on this LOADng router. This table has INDEX { loadngLibLocalIfSetIfAddrIndex, loadngLibLocalIfSetIfIndex }.
- o loadngLibDestAddressSetTable - records addresses, for which a LOADng Router will generate RREPs in response to received RREQs, in addition to its own interface addresses (as listed in the Local Interface Set). This table has INDEX { loadngLibDestAddressSetIndex }.
- o loadngBlacklistedNeighborSetTable - records the neighbor interface addresses of a LOADng Router, with which connectivity has been detected to be unidirectional. This table has INDEX { loadngBlacklistedNeighborSetIndex }.
- o loadngRoutingSetTable - records the next hop on the route to each known destination. This table has INDEX { loadngRoutingSetIndex }.
- o loadngPendingAckSetTable - records information about RREPs which have been transmitted with the ackrequired flag set, and for which an RREP_ACK has not yet been received. This table has INDEX { loadngPendingAckSetIndex }.

[6.](#) Relationship to Other MIB Modules

This section specifies the relationship of the MIB module contained in this document to other standards, particularly to standards containing other MIB modules. MIB modules and specific definitions imported from MIB modules that SHOULD be implemented in conjunction with the MIB module contained within this document are identified in this section.

[6.1.](#) Relationship to the SNMPv2-MIB

The System group in the SNMPv2-MIB module [[RFC3418](#)] is defined as being mandatory for all systems, and the objects apply to the entity as a whole. The System group provides identification of the management entity and certain other system-wide data. The LOADng-MIB

module does not duplicate those objects.

6.2. MIB Modules Required for IMPORTS

The following LOADng-MIB module IMPORTS objects from SNMPv2-SMI [[RFC2578](#)], SNMPv2-TC [[RFC2579](#)], SNMPv2-CONF [[RFC2580](#)], IF-MIB [[RFC2863](#)], and INET-ADDRESS-MIB [[RFC4001](#)].

7. Definitions

This section contains the MIB module defined by the specification.

```
LOADNG-MIB DEFINITIONS ::= BEGIN
```

```
-- This MIB module defines objects for the management of
-- RFC XXXX: Lightweight On-demand Ad hoc Distance-vector
-- Routing Protocol - Next Generation (LOADng),
-- T. Clausen, A. Colin de Verdiere,
-- J. Yi, A. Niktash, Y. Igarashi, H. Satoh, U. Herberg,
-- C. Lavenu, T. Lys, C. Perkins, and J. Dean, October 2012.
```

```
IMPORTS
```

```
    MODULE-IDENTITY, OBJECT-TYPE,
    Integer32, Unsigned32, mib-2
        FROM SNMPv2-SMI -- RFC2578
```

```
    TruthValue, TimeStamp,
    RowStatus
        FROM SNMPv2-TC -- RFC2579
```

```
    MODULE-COMPLIANCE, OBJECT-GROUP
        FROM SNMPv2-CONF -- STD58
```

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```
    InetAddressType, InetAddress
        FROM INET-ADDRESS-MIB -- RFC4001
```

```
    InterfaceIndex
        FROM IF-MIB -- RFC2863
```

```
;
```

loadngMIB MODULE-IDENTITY

LAST-UPDATED "201211071000Z" -- 7 November 2012

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DESCRIPTION

"This loadng-MIB module is applicable to routers
implementing the Lightweight On-demand Ad hoc
Distance-vector Routing Protocol -

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Legal Provisions Relating to IETF Documents
(<http://trustee.ietf.org/license-info>).

This version of this MIB module is part of RFC XXXX; see
the RFC itself for full legal notices."

```
-- revision
REVISION "201211071000Z" -- 7 November 2012
DESCRIPTION
    "Initial version of this MIB module,
      published as RFC XXXX."
-- RFC-Editor assigns XXXX
 ::= { mib-2 XXXX } -- to be assigned by IANA

--
-- Top-Level Components of this MIB Module
--
loadngObjects      OBJECT IDENTIFIER ::= { loadngMIB 1 }
loadngConformance OBJECT IDENTIFIER ::= { loadngMIB 2 }

--
-- loadngObjects
--
--      1) Configuration Objects Group
--      2) State Objects Group

--
-- loadngConfigurationObjGrp
--
-- Contains the LOADng objects which configure specific options
-- which determine the overall performance and operation of the
-- LOADng protocol.

loadngConfigurationObjGrp OBJECT IDENTIFIER ::= { loadngObjects 1 }
```

`loadngInterfaceTable` OBJECT-TYPE`SYNTAX` SEQUENCE OF `LoadngInterfaceEntry``MAX-ACCESS` not-accessible`STATUS` current`DESCRIPTION`

"`loadngInterfaceTable` describes the configuration of the interfaces of this router that are intended to use MANET control protocols. As such, this table 'sparse augments' the `ifTable` specifically when LOADng is to be configured to operate over this interface. The interface is identified by the `ifIndex` from the interfaces group defined in the Interfaces Group MIB module.

A conceptual row in this table exists if and only if either a manager has explicitly created the row or there is an interface on the managed device that supports and runs LOADng.

The manager can create a row by setting `rowStatus` to 'createAndGo' or 'createAndWait'. Row objects having associated DEFVAL clauses are automatically defined by the agent with these values during row creation, unless the manager explicitly defines these object values during the row creation.

If the corresponding entry with `ifIndex` value is deleted from the Interface Table, then the entry in this table is automatically deleted, LOADng is disabled on this interface, and all configuration and state information related to this interface is to be removed from memory."

`REFERENCE`

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

::= { `loadngConfigurationObjGrp` 1 }

`loadngInterfaceEntry` OBJECT-TYPE`SYNTAX` `LoadngInterfaceEntry``MAX-ACCESS` not-accessible`STATUS` current`DESCRIPTION`

"`loadngInterfaceEntry` describes one LOADng local interface configuration as indexed by

its ifIndex as defined in the Standard MIB II Interface Table ([RFC 2863](#)).

The objects in this table are persistent, and when written, the device SHOULD save the change to non-volatile storage. For further information on the storage behavior for these objects, refer to the description for the loadngIfRowStatus object."

```
INDEX { loadngIfIndex }
 ::= { loadngInterfaceTable 1 }
```

```
LoadngInterfaceEntry ::=
    SEQUENCE {
        loadngIfIndex
            InterfaceIndex,
        loadngRREPAckRequired
            TruthValue,
        loadngRREPAckTimeout
            Unsigned32,
        loadngIfRowStatus
            RowStatus
    }
```

```
loadngIfIndex    OBJECT-TYPE
    SYNTAX        InterfaceIndex
    MAX-ACCESS    not-accessible
    STATUS        current
    DESCRIPTION   "This value MUST correspond to an ifIndex referring
                  to a valid entry in the Interfaces Table."
    REFERENCE    "RFC 2863 - The Interfaces Group MIB, McCloghrie, K.,
                  and F. Kastenholtz, June 2000"
    ::= { loadngInterfaceEntry 1 }
```

```
loadngRREPAckRequired OBJECT-TYPE
    SYNTAX        TruthValue
    MAX-ACCESS    read-create
    STATUS        current
    DESCRIPTION
```

"loadngRREPAckRequired corresponds to RREP_ACK_REQUIRED of LOADng. It represents a boolean flag, which indicates (if set) that the router is configured to expect that each RREP it sends be confirmed by an RREP_ACK or (if cleared) that no RREP_ACK is expected.

This object is persistent and when written

the entity SHOULD save the change to non-volatile storage."

REFERENCE

"[Section 5](#) on Protocol Parameters of RFC XXXX - The Lightweight On-demand Ad hoc Distance-vector Routing Protocol - Next Generation (LOADng), Clausen, T., Colin de Verdiere, A., Yi, J., Niktash, A., Igarashi, Y., Satoh, H., Herberg, U., Lavenu, C., Lys, T., C. Perkins, and J. Dean, October 2012"

DEFVAL { false }

::= { loadngInterfaceEntry 2 }

loadngRREPAckTimeout OBJECT-TYPE

SYNTAX Unsigned32

UNITS "milliseconds"

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"loadngRREPAckTimeout corresponds to RREP_ACK_TIMEOUT of LOADng. It represents the minimum time after transmission of an RREP, that a LOADng Router should wait for an RREP_ACK from a neighbor LOADng Router, before considering that the link to this neighbor is unidirectional.

This object is persistent and when written the entity SHOULD save the change to non-volatile storage."

REFERENCE

"[Section 5](#) on Protocol Parameters of

RFC XXXX - The Lightweight On-demand Ad hoc
Distance-vector Routing Protocol - Next Generation (LOADng),
Clausen, T., Colin de Verdiere, A., Yi, J., Niktash, A.,
Igarashi, Y., Satoh, H., Herberg, U., Lavenu, C.,
Lys, T., C. Perkins, and J. Dean, October 2012"

```
DEFVAL { 500 }  
::= { loadngInterfaceEntry 3 }
```

loadngIfRowStatus OBJECT-TYPE

SYNTAX RowStatus

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"This object permits management of the table
by facilitating actions such as row creation,

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construction, and destruction. The value of
this object has no effect on whether other
objects in this conceptual row can be
modified.

An entry may not exist in the 'active(1)' state unless all
objects in the entry have a defined appropriate value. For
objects with DEFVAL clauses, the management station
does not need to specify the value of this object in order
for the row to transit to the 'active(1)' state; the default
value for this object is used. For objects that do not
have DEFVAL clauses, then the network manager MUST
specify the value of this object prior to this row
transitioning to the 'active(1)' state.

When this object transitions to 'active(1)', all objects
in this row SHOULD be written to non-volatile (stable)
storage. Read-create objects in this row MAY be modified.
When an object in a row with loadngIfRowStatus of 'active(1)'
is changed, then the updated value MUST be
reflected in LOADng, and this new object value MUST be
written to non-volatile storage.

If the value of this object is not equal to 'active(1)',
all associated entries in the loadngLibLocalIfSetTable

```

        MUST be deleted."
REFERENCE
    "RFC XXXX - The Lightweight On-demand Ad hoc
    Distance-vector Routing Protocol - Next Generation (LOADng),
    Clausen, T., Colin de Verdiere, A., Yi, J., Niktash, A.,
    Igarashi, Y., Satoh, H., Herberg, U., Lavenu, C.,
    Lys, T., C. Perkins, and J. Dean, October 2012"
DEFVAL { active }
 ::= { loadngInterfaceEntry 4 }

```

```

--
-- Router Parameters
--

```

```

loadngNetTraversalTime OBJECT-TYPE
    SYNTAX      Unsigned32
    UNITS       "milliseconds"
    MAX-ACCESS  read-write
    STATUS      current
    DESCRIPTION
        "loadngNetTraversalTime corresponds to
        NET_TRAVERSAL_TIME of LOADng. It represents

```

the maximum time that a packet is expected to take when traversing from one end of the network to the other.

This object is persistent and when written the entity SHOULD save the change to non-volatile storage."

```

REFERENCE
    "Section 5 on Protocol Parameters of
    RFC XXXX - The Lightweight On-demand Ad hoc
    Distance-vector Routing Protocol - Next Generation (LOADng),
    Clausen, T., Colin de Verdiere, A., Yi, J., Niktash, A.,
    Igarashi, Y., Satoh, H., Herberg, U., Lavenu, C.,
    Lys, T., C. Perkins, and J. Dean, October 2012"
DEFVAL { 500 }
 ::= { loadngConfigurationObjGrp 2 }

```

```

loadngRREQRetries OBJECT-TYPE
    SYNTAX      Unsigned32 (0..255)
    MAX-ACCESS  read-write
    STATUS      current
    DESCRIPTION
        "loadngRREQRetries corresponds to
        RREQ_RETRIES of LOADng. It represents
        the maximum number of subsequent RREQs
        that a particular router may generate
        in order to discover a route to a
        destination, before declaring that
        destination unreachable.

        This object is persistent and when written
        the entity SHOULD save the change to
        non-volatile storage."
    REFERENCE
        "Section 5 on Protocol Parameters of
        RFC XXXX - The Lightweight On-demand Ad hoc
        Distance-vector Routing Protocol - Next Generation (LOADng),
        Clausen, T., Colin de Verdiere, A., Yi, J., Niktash, A.,
        Igarashi, Y., Satoh, H., Herberg, U., Lavenu, C.,
        Lys, T., C. Perkins, and J. Dean, October 2012"
    DEFVAL { 3 }
 ::= { loadngConfigurationObjGrp 3 }

```

```

loadngRREQRatelimit OBJECT-TYPE
    SYNTAX      Unsigned32 (1..255)
    MAX-ACCESS  read-write

```

```

STATUS      current
DESCRIPTION
    "loadngRREQRatelimit corresponds to
    RREQ_RATELIMIT of LOADng. It represents
    the maximum number of RREQs that a particular
    router is allowed to send per second.

    This object is persistent and when written
    the entity SHOULD save the change to
    non-volatile storage."
REFERENCE

```

"[Section 5](#) on Protocol Parameters of
RFC XXXX – The Lightweight On-demand Ad hoc
Distance-vector Routing Protocol – Next Generation (LOADng),
Clausen, T., Colin de Verdiere, A., Yi, J., Niktash, A.,
Igarashi, Y., Satoh, H., Herberg, U., Lavenu, C.,
Lys, T., C. Perkins, and J. Dean, October 2012"
DEFVAL { 3 }
::= { loadngConfigurationObjGrp 4 }

loadngRHoldTime OBJECT-TYPE
SYNTAX Unsigned32
UNITS "milliseconds"
MAX-ACCESS read-write
STATUS current
DESCRIPTION
"loadngRHoldTime corresponds to
R_HOLD_TIME of LOADng. It represents
the minimum time a Routing Tuple should
be kept in the Routing Set after it was
last refreshed. This may be a network-wide
constant, but may also be a variable whose
value is defined by an auxiliary mechanism,
e.g., by an extension to this protocol.

This object is persistent and when written
the entity SHOULD save the change to
non-volatile storage."
REFERENCE
"[Section 5](#) on Protocol Parameters of
RFC XXXX – The Lightweight On-demand Ad hoc
Distance-vector Routing Protocol – Next Generation (LOADng),
Clausen, T., Colin de Verdiere, A., Yi, J., Niktash, A.,
Igarashi, Y., Satoh, H., Herberg, U., Lavenu, C.,
Lys, T., C. Perkins, and J. Dean, October 2012"
DEFVAL { 10000 }
::= { loadngConfigurationObjGrp 5 }

loadngMaxDist OBJECT-TYPE
SYNTAX Unsigned32
MAX-ACCESS read-write
STATUS current

DESCRIPTION

"loadngMaxDist corresponds to MAX_DIST of LOADng. It represents the value representing the maximum possible metric.

This object is persistent and when written the entity SHOULD save the change to non-volatile storage."

REFERENCE

"[Section 5](#) on Protocol Parameters of RFC XXXX - The Lightweight On-demand Ad hoc Distance-vector Routing Protocol - Next Generation (LOADng), Clausen, T., Colin de Verdiere, A., Yi, J., Niktash, A., Igarashi, Y., Satoh, H., Herberg, U., Lavenu, C., Lys, T., C. Perkins, and J. Dean, October 2012"

DEFVAL { 255 }

::= { loadngConfigurationObjGrp 6 }

loadngBHoldTime OBJECT-TYPE

SYNTAX Unsigned32

UNITS "milliseconds"

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"loadngBHoldTime corresponds to the B_HOLD_TIME of LOADng. It represents is the time during which the link between the neighbor LOADng Router and this LOADng Router are considered as non-bidirectional.

This object is persistent and when written the entity SHOULD save the change to non-volatile storage."

REFERENCE

"[Section 5](#) on Protocol Parameters of RFC XXXX - The Lightweight On-demand Ad hoc Distance-vector Routing Protocol - Next Generation (LOADng), Clausen, T., Colin de Verdiere, A., Yi, J., Niktash, A., Igarashi, Y., Satoh, H., Herberg, U., Lavenu, C., Lys, T., C. Perkins, and J. Dean, October 2012"

DEFVAL { 15 }

::= { loadngConfigurationObjGrp 7 }

`loadngUseBidirectionalLinkOnly` OBJECT-TYPE`SYNTAX TruthValue``MAX-ACCESS read-write``STATUS current``DESCRIPTION`

"loadngUseBidirectionalLinkOnly corresponds to USE_BIDIRECTIONAL_LINK_ONLY of LOADng. It represents a boolean flag, which indicates if the LOADng Router only uses verified bi-directional links for data packet forwarding. It is set by default. If cleared, then the LOADng Router can use links which have not been verified to be bi-directional.

This object is persistent and when written the entity SHOULD save the change to non-volatile storage."

`REFERENCE`

"[Section 5](#) on Protocol Parameters of RFC XXXX - The Lightweight On-demand Ad hoc Distance-vector Routing Protocol - Next Generation (LOADng), Clausen, T., Colin de Verdiere, A., Yi, J., Niktash, A., Igarashi, Y., Satoh, H., Herberg, U., Lavenu, C., Lys, T., C. Perkins, and J. Dean, October 2012"

`DEFVAL { true }``::= { loadngConfigurationObjGrp 8 }``loadngRreqMaxJitter` OBJECT-TYPE`SYNTAX Unsigned32``UNITS "milliseconds"``MAX-ACCESS read-write``STATUS current``DESCRIPTION`

"loadngRreqMaxJitter corresponds to RREQ_MAX_JITTER of LOADng. It represents default value of MAXJITTER used in [RFC 5148](#) for RREQ messages forwarded by this LOADng Router.

This object is persistent and when written the entity SHOULD save the change to non-volatile storage."

`REFERENCE`

"[Section 5 of RFC 5148](#) - Jitter Considerations in Mobile Ad Hoc Networks (MANETs), Clausen, T., Dearlove, C., and B. Adamson, February 2008"

`DEFVAL { 500 }`

```
::= { loadngConfigurationObjGrp 9 }
```

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```
loadngMaxHopCount OBJECT-TYPE
```

```
SYNTAX      Unsigned32
```

```
MAX-ACCESS  read-write
```

```
STATUS      current
```

```
DESCRIPTION
```

```
"loadngMaxDist corresponds to
MAX_HOP_COUNT of LOADng. It represents
the maximum number of transmissions permitted by
any RREQ or RREP message..
```

```

This object is persistent and when written
the entity SHOULD save the change to
non-volatile storage."
```

```
REFERENCE
```

```
"Section 5 on Protocol Parameters of
RFC XXXX - The Lightweight On-demand Ad hoc
Distance-vector Routing Protocol - Next Generation (LOADng),
Clausen, T., Colin de Verdiere, A., Yi, J., Niktash, A.,
Igarashi, Y., Satoh, H., Herberg, U., Lavenu, C.,
Lys, T., C. Perkins, and J. Dean, October 2012"
```

```
DEFVAL { 255 }
```

```
::= { loadngConfigurationObjGrp 10 }
```

```
--
```

```
-- Local Interface SetTable
```

```
--
```

```
loadngLibLocalIfSetTable OBJECT-TYPE
```

```
SYNTAX      SEQUENCE OF LoadngLibLocalIfSetEntry
```

```
MAX-ACCESS  not-accessible
```

```
STATUS      current
```

```
DESCRIPTION
```

```
"A router's Local Interface Set records all
network addresses that are defined as local
interface network addresses.
As such, this table 'sparse augments' the
loadngInterfaceTable when network addresses are
being defined for the interfaces existing within
the loadngInterfaceTable. The local interface
```

is defined by the loadngIfIndex.

The Local Interface Set consists of Local Interface Address Tuples per MANET interface and their prefix lengths (in order to determine the network addresses related to the interface).

A conceptual row in this table exists if and only

if a manager has explicitly created the row. The manager can create a row by setting rowStatus to 'createAndGo' or 'createAndWait'."

REFERENCE

"RFC XXXX - The Lightweight On-demand Ad hoc Distance-vector Routing Protocol - Next Generation (LOADng), Clausen, T., Colin de Verdiere, A., Yi, J., Niktash, A., Igarashi, Y., Satoh, H., Herberg, U., Lavenu, C., Lys, T., C. Perkins, and J. Dean, October 2012"

::= { loadngConfigurationObjGrp 12 }

loadngLibLocalIfSetEntry OBJECT-TYPE

SYNTAX LoadngLibLocalIfSetEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"A router's Local Interface Set consists of Local Interface Tuples for each network interface.

(I_local_iface_addr_list)

Each tuple contains a list of one or more addresses of this interface."

REFERENCE

"RFC XXXX - The Lightweight On-demand Ad hoc Distance-vector Routing Protocol - Next Generation (LOADng), Clausen, T., Colin de Verdiere, A., Yi, J., Niktash, A., Igarashi, Y., Satoh, H., Herberg, U., Lavenu, C., Lys, T., C. Perkins, and J. Dean, October 2012"

INDEX { loadngLibLocalIfSetIndex, loadngLibLocalIfSetIfIndex }

::= { loadngLibLocalIfSetTable 1 }

```

LoadngLibLocalIfSetEntry ::=
    SEQUENCE {
        loadngLibLocalIfSetIndex
            Integer32,
        loadngLibLocalIfSetIfIndex
            InterfaceIndex,
        loadngLibLocalIfSetIpAddrType
            InetAddressType,
        loadngLibLocalIfSetIpAddr
            InetAddress,
        loadngLibLocalIfSetRowStatus
            RowStatus
    }

```

loadngLibLocalIfSetIndex OBJECT-TYPE

```

SYNTAX      Integer32 (0..65535)
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
    "The index for this table. Necessary
     because multiple addresses may be associated
     with a given loadngIfIndex."
REFERENCE
    "RFC XXXX - The Lightweight On-demand Ad hoc
     Distance-vector Routing Protocol - Next Generation (LOADng),
     Clausen, T., Colin de Verdiere, A., Yi, J., Niktash, A.,
     Igarashi, Y., Satoh, H., Herberg, U., Lavenu, C.,
     Lys, T., C. Perkins, and J. Dean, October 2012"
::= { loadngLibLocalIfSetEntry 1 }

```

loadngLibLocalIfSetIfIndex OBJECT-TYPE

```

SYNTAX      InterfaceIndex
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "Specifies the local loadngIfIndex for which this
     IP address was added."
REFERENCE
    "RFC XXXX - The Lightweight On-demand Ad hoc
     Distance-vector Routing Protocol - Next Generation (LOADng),
     Clausen, T., Colin de Verdiere, A., Yi, J., Niktash, A.,

```

Igarashi, Y., Satoh, H., Herberg, U., Lavenu, C.,
Lys, T., C. Perkins, and J. Dean, October 2012"
::= { loadngLibLocalIfSetEntry 2 }

loadngLibLocalIfSetIpAddressType OBJECT-TYPE

SYNTAX InetAddressType

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The type of the loadngLibLocalIfSetIpAddress
in the InetAddress MIB ([RFC 4001](#)).

Only the values 'ipv4(1)' and
'ipv6(2)' are supported."

REFERENCE

"RFC XXXX - The Lightweight On-demand Ad hoc
Distance-vector Routing Protocol - Next Generation (LOADng),
Clausen, T., Colin de Verdiere, A., Yi, J., Niktash, A.,
Igarashi, Y., Satoh, H., Herberg, U., Lavenu, C.,
Lys, T., C. Perkins, and J. Dean, October 2012"

::= { loadngLibLocalIfSetEntry 3 }

loadngLibLocalIfSetIpAddress OBJECT-TYPE

SYNTAX InetAddress (SIZE(4|16))

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"loadngLibLocalIfSetIpAddress is an
address of an interface of
this router.

This object is interpreted according to
the setting of loadngLibLocalIfSetIpAddressType."

REFERENCE

"RFC XXXX - The Lightweight On-demand Ad hoc
Distance-vector Routing Protocol - Next Generation (LOADng),
Clausen, T., Colin de Verdiere, A., Yi, J., Niktash, A.,
Igarashi, Y., Satoh, H., Herberg, U., Lavenu, C.,
Lys, T., C. Perkins, and J. Dean, October 2012"

::= { loadngLibLocalIfSetEntry 4 }

loadngLibLocalIfSetRowStatus OBJECT-TYPE

SYNTAX RowStatus

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"This object permits management of the table by facilitating actions such as row creation, construction, and destruction. The value of this object has no effect on whether other objects in this conceptual row can be modified.

An entry may not exist in the 'active(1)' state unless all read-create objects in the entry have a defined appropriate value. As no objects in this table have DEFVAL clauses, the management station MUST specify the values of all read-create objects prior to this row transitioning to the 'active(1)' state.

When this object transitions to 'active(1)', all objects in this row SHOULD be written to non-volatile (stable) storage. Read-create objects in this row MAY be modified. When an object in a row with loadngIfRowStatus of 'active(1)' is changed, then the updated value MUST be reflected in LOADng, and this new object value MUST be written to non-volatile storage."

REFERENCE

"RFC XXXX - The Lightweight On-demand Ad hoc Distance-vector Routing Protocol - Next Generation (LOADng),

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Igarashi, Y., Satoh, H., Herberg, U., Lavenu, C.,
Lys, T., C. Perkins, and J. Dean, October 2012"

::= { loadngLibLocalIfSetEntry 5 }

--

-- Destination Address Set Table

-- Entry (foreach local interface): (D_address)

--

```
loadngLibDestAddressSetTable OBJECT-TYPE
    SYNTAX          SEQUENCE OF LoadngLibDestAddressSetEntry
    MAX-ACCESS      not-accessible
    STATUS          current
    DESCRIPTION
        "The Destination Address Set records
        addresses, for which a LOADng Router
        will generate RREPs in response to received
        RREQs, in addition to its own interface addresses
        (as listed in the Local Interface Set). The
        Destination Address Set thus represents those
        destinations (i.e., hosts), for which this LOADng
        Router is providing connectivity. It consists of
        Destination Address Tuples."
    REFERENCE
        "RFC XXXX - The Lightweight On-demand Ad hoc
        Distance-vector Routing Protocol - Next Generation (LOADng),
        Clausen, T., Colin de Verdiere, A., Yi, J., Niktash, A.,
        Igarashi, Y., Satoh, H., Herberg, U., Lavenu, C.,
        Lys, T., C. Perkins, and J. Dean, October 2012"
 ::= { loadngConfigurationObjGrp 13 }
```

```
loadngLibDestAddressSetEntry OBJECT-TYPE
    SYNTAX          LoadngLibDestAddressSetEntry
    MAX-ACCESS      not-accessible
    STATUS          current
    DESCRIPTION
        "The Destination Address Set consists
        of Destination Address Tuples:

        (D_address)"
    REFERENCE
        "RFC XXXX - The Lightweight On-demand Ad hoc
        Distance-vector Routing Protocol - Next Generation (LOADng),
        Clausen, T., Colin de Verdiere, A., Yi, J., Niktash, A.,
        Igarashi, Y., Satoh, H., Herberg, U., Lavenu, C.,
```

```
        Lys, T., C. Perkins, and J. Dean, October 2012"
    INDEX { loadngLibDestAddressSetIndex }
 ::= { loadngLibDestAddressSetTable 1 }
```

```
LoadngLibDestAddressSetEntry ::=
```



```

SEQUENCE {
    loadngLibDestAddressSetIndex
        Integer32,
    loadngLibDestAddressSetIpAddrType
        InetAddressType,
    loadngLibDestAddressSetIpAddr
        InetAddress
}

loadngLibDestAddressSetIndex OBJECT-TYPE
    SYNTAX      Integer32 (0..65535)
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The index for this table. Necessary
        because multiple addresses may be associated
        with a given loadngIfIndex."
    REFERENCE
        "RFC XXXX - The Lightweight On-demand Ad hoc
        Distance-vector Routing Protocol - Next Generation (LOADng),
        Clausen, T., Colin de Verdiere, A., Yi, J., Niktash, A.,
        Igarashi, Y., Satoh, H., Herberg, U., Lavenu, C.,
        Lys, T., C. Perkins, and J. Dean, October 2012"
 ::= { loadngLibDestAddressSetEntry 1 }

loadngLibDestAddressSetIpAddrType OBJECT-TYPE
    SYNTAX      InetAddressType
    MAX-ACCESS  read-write
    STATUS      current
    DESCRIPTION
        "The type of the loadngLibDestAddressSetIpAddr
        in the InetAddress MIB (RFC4001).

        Only the values 'ipv4(1)' and
        'ipv6(2)' are supported."
    REFERENCE
        "RFC XXXX - The Lightweight On-demand Ad hoc
        Distance-vector Routing Protocol - Next Generation (LOADng),
        Clausen, T., Colin de Verdiere, A., Yi, J., Niktash, A.,
        Igarashi, Y., Satoh, H., Herberg, U., Lavenu, C.,
        Lys, T., C. Perkins, and J. Dean, October 2012"
 ::= { loadngLibDestAddressSetEntry 2 }

```

```

loadngLibDestAddressSetIpAddr OBJECT-TYPE
    SYNTAX      InetAddress (SIZE(4|16))
    MAX-ACCESS  read-write
    STATUS      current
    DESCRIPTION
        "loadngLibDestAddressSetIpAddr is an
         address of an interface of
         a router.

         This object is interpreted according to
         the setting of loadngLibDestAddressSetIpAddrType."
    REFERENCE
        "RFC XXXX - The Lightweight On-demand Ad hoc
         Distance-vector Routing Protocol - Next Generation (LOADng),
         Clausen, T., Colin de Verdiere, A., Yi, J., Niktash, A.,
         Igarashi, Y., Satoh, H., Herberg, U., Lavenu, C.,
         Lys, T., C. Perkins, and J. Dean, October 2012"
 ::= { loadngLibDestAddressSetEntry 3 }

```

```

--
-- loadngStateObjGrp
--

-- Contains information describing the current state of the LOADng
-- process on this router.

```

```

loadngStateObjGrp    OBJECT IDENTIFIER ::= { loadngObjects 2 }

```

```

loadngUpTime OBJECT-TYPE
    SYNTAX TimeStamp
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "The value of sysUpTime at the time current LOADng
         process was initialized."
 ::= { loadngStateObjGrp 1 }

```

```

--
-- Blacklisted Neighbor Set Table
--

```

```

loadngBlacklistedNeighborSetTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF LoadngBlacklistedNeighborSetEntry

```

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MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"The Blacklisted Neighbor Set records the neighbor interface addresses of a LOADng Router, with which connectivity has been detected to be unidirectional. Specifically, the Blacklisted Neighbor Set records neighbors from which an RREQ has been received (i.e., through which a Forward Route would possible) but to which it has been determined that it is not possible to communicate (i.e., forwarding Route Replies via this neighbor fails, rendering installing the Forward Route impossible). It consists of Blacklisted Neighbor Tuples."

REFERENCE

"RFC XXXX - The Lightweight On-demand Ad hoc Distance-vector Routing Protocol - Next Generation (LOADng), Clausen, T., Colin de Verdiere, A., Yi, J., Niktash, A., Igarashi, Y., Satoh, H., Herberg, U., Lavenu, C., Lys, T., C. Perkins, and J. Dean, October 2012"

::= { loadngStateObjGrp 2 }

loadngBlacklistedNeighborSetEntry OBJECT-TYPE

SYNTAX LoadngBlacklistedNeighborSetEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"A router's Blacklisted Neighbor Set consists of Blacklisted Neighbor Tuples, one per network address:loadngBlacklistedNeighborSet

(B_neighbor_address, B_valid_time)

The association between these addrs and the router's Interface is found in the Standard MIB II's IP address table ([RFC1213](#))."

REFERENCE

"RFC XXXX - The Lightweight On-demand Ad hoc Distance-vector Routing Protocol - Next Generation (LOADng), Clausen, T., Colin de Verdiere, A., Yi, J., Niktash, A., Igarashi, Y., Satoh, H., Herberg, U., Lavenu, C.,

Lys, T., C. Perkins, and J. Dean, October 2012"
INDEX { loadngBlacklistedNeighborSetIndex }
 ::= { loadngBlacklistedNeighborSetTable 1 }

LoadngBlacklistedNeighborSetEntry ::=
SEQUENCE {

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```
    loadngBlacklistedNeighborSetIndex
        Integer32,
    loadngBlacklistedNeighborSetIpAddressType
        InetAddressType,
    loadngBlacklistedNeighborSetIpAddress
        InetAddress,
    loadngBlacklistedNeighborSetBTime
        TimeStamp
}

loadngBlacklistedNeighborSetIndex OBJECT-TYPE
    SYNTAX      Integer32 (0..65535)
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The index for this table."
    REFERENCE
        "RFC XXXX - The Lightweight On-demand Ad hoc
        Distance-vector Routing Protocol - Next Generation (LOADng),
        Clausen, T., Colin de Verdiere, A., Yi, J., Niktash, A.,
        Igarashi, Y., Satoh, H., Herberg, U., Lavenu, C.,
        Lys, T., C. Perkins, and J. Dean, October 2012"
    ::= { loadngBlacklistedNeighborSetEntry 1 }

loadngBlacklistedNeighborSetIpAddressType OBJECT-TYPE
    SYNTAX      InetAddressType
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The type of the loadngBlacklistedNeighborSetIpAddress
        in the InetAddress MIB (RFC 4001).

        Only the values 'ipv4(1)' and
        'ipv6(2)' are supported."
    REFERENCE
```

```

        "LOADng."
 ::= { loadngBlacklistedNeighborSetEntry 2 }

loadngBlacklistedNeighborSetIpAddress OBJECT-TYPE
    SYNTAX      InetAddress (SIZE(4|16))
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "loadngBlacklistedNeighborSetIpAddress is the
         address of the blacklisted neighbor interface."
    REFERENCE
        "RFC XXXX - The Lightweight On-demand Ad hoc
         Distance-vector Routing Protocol - Next Generation (LOADng),

```

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```

        Clausen, T., Colin de Verdiere, A., Yi, J., Niktash, A.,
        Igarashi, Y., Satoh, H., Herberg, U., Lavenu, C.,
        Lys, T., C. Perkins, and J. Dean, October 2012"
 ::= { loadngBlacklistedNeighborSetEntry 3 }

loadngBlacklistedNeighborSetBTime OBJECT-TYPE
    SYNTAX      TimeStamp
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "loadngBlacklistedNeighborSetBTime specifies the value
         of sysUptime when this entry should expire and be
         removed from the loadngBlacklistedNeighborSetTable."
    REFERENCE
        "RFC XXXX - The Lightweight On-demand Ad hoc
         Distance-vector Routing Protocol - Next Generation (LOADng),
         Clausen, T., Colin de Verdiere, A., Yi, J., Niktash, A.,
         Igarashi, Y., Satoh, H., Herberg, U., Lavenu, C.,
         Lys, T., C. Perkins, and J. Dean, October 2012"
 ::= { loadngBlacklistedNeighborSetEntry 4 }

```

```

--
-- Routing Set
--

```

loadngRoutingSetTable OBJECT-TYPE
 SYNTAX SEQUENCE OF LoadngRoutingSetEntry
 MAX-ACCESS not-accessible
 STATUS current
 DESCRIPTION
 "The Routing Set records the next hop
 on the route to each known destination,
 when such a route is known. It consists of
 Routing Tuples."
 REFERENCE
 "RFC XXXX - The Lightweight On-demand Ad hoc
 Distance-vector Routing Protocol - Next Generation (LOADng),
 Clausen, T., Colin de Verdiere, A., Yi, J., Niktash, A.,
 Igarashi, Y., Satoh, H., Herberg, U., Lavenu, C.,
 Lys, T., C. Perkins, and J. Dean, October 2012"
 ::= { loadngStateObjGrp 3 }

loadngRoutingSetEntry OBJECT-TYPE
 SYNTAX LoadngRoutingSetEntry
 MAX-ACCESS not-accessible

STATUS current
 DESCRIPTION
 "A router's Routing Set consists
 of Routing Tuples:

 (R_dest_addr, R_next_addr, R_metric,
 R_metric_type, R_hop_count,
 R_seq_num, R_valid_time,
 R_bidirectional, R_local_iface_addr)"
 REFERENCE
 "RFC XXXX - The Lightweight On-demand Ad hoc
 Distance-vector Routing Protocol - Next Generation (LOADng),
 Clausen, T., Colin de Verdiere, A., Yi, J., Niktash, A.,
 Igarashi, Y., Satoh, H., Herberg, U., Lavenu, C.,
 Lys, T., C. Perkins, and J. Dean, October 2012"
 INDEX { loadngRoutingSetIndex }
 ::= { loadngRoutingSetTable 1 }

LoadngRoutingSetEntry ::=

SEQUENCE {

loadngRoutingSetIndex

```

        Integer32,
loadngRoutingSetDestIpAddrType
        InetAddressType,
loadngRoutingSetDestIpAddr
        InetAddress,
loadngRoutingSetNextIpAddrType
        InetAddressType,
loadngRoutingSetNextIpAddr
        InetAddress,
loadngRoutingSetMetric
        Unsigned32,
loadngRoutingSetMetricType
        Integer32,
loadngRoutingSetHopCount
        Integer32,
loadngRoutingSetSeqnum
        Integer32,
loadngRoutingSetValidTime
        TimeStamp,
loadngRoutingSetBidirectional
        TruthValue,
loadngRoutingSetLocalIfaceIpAddrType
        InetAddressType,
loadngRoutingSetLocalIfaceIpAddr
        InetAddress
    }

```

```

loadngRoutingSetIndex  OBJECT-TYPE
    SYNTAX      Integer32 (0..65535)
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The index for this table."
    REFERENCE
        "RFC XXXX - The Lightweight On-demand Ad hoc
        Distance-vector Routing Protocol - Next Generation (LOADng),
        Clausen, T., Colin de Verdiere, A., Yi, J., Niktash, A.,
        Igarashi, Y., Satoh, H., Herberg, U., Lavenu, C.,
        Lys, T., C. Perkins, and J. Dean, October 2012"
 ::= { loadngRoutingSetEntry 1 }

```

```

loadngRoutingSetDestIpAddressType OBJECT-TYPE
    SYNTAX      InetAddressType
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The type of the loadngRoutingSetDestIpAddress
        in the InetAddress MIB (RFC 4001).

        Only the values 'ipv4(1)' and
        'ipv6(2)' are supported."
    REFERENCE
        "RFC XXXX - The Lightweight On-demand Ad hoc
        Distance-vector Routing Protocol - Next Generation (LOADng),
        Clausen, T., Colin de Verdiere, A., Yi, J., Niktash, A.,
        Igarashi, Y., Satoh, H., Herberg, U., Lavenu, C.,
        Lys, T., C. Perkins, and J. Dean, October 2012"
 ::= { loadngRoutingSetEntry 2 }

```

```

loadngRoutingSetDestIpAddress OBJECT-TYPE
    SYNTAX      InetAddress (SIZE(4|16))
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "loadngRoutingSetDestIpAddressType is the address
        of the destination, either the address of an
        interface of a destination LOADng Router, or
        the address of an interface reachable via the
        destination LOADng Router, but which is outside
        the routing domain."
    REFERENCE
        "RFC XXXX - The Lightweight On-demand Ad hoc
        Distance-vector Routing Protocol - Next Generation (LOADng),
        Clausen, T., Colin de Verdiere, A., Yi, J., Niktash, A.,
        Igarashi, Y., Satoh, H., Herberg, U., Lavenu, C.,

```

```

        Lys, T., C. Perkins, and J. Dean, October 2012"
 ::= { loadngRoutingSetEntry 3 }

```

```

loadngRoutingSetNextIpAddressType OBJECT-TYPE
    SYNTAX      InetAddressType
    MAX-ACCESS  read-only
    STATUS      current

```


DESCRIPTION

"The type of the loadngRoutingSetNextIpAddress in the InetAddress MIB ([RFC 4001](#)).

Only the values 'ipv4(1)' and 'ipv6(2)' are supported."

REFERENCE

"RFC XXXX - The Lightweight On-demand Ad hoc Distance-vector Routing Protocol - Next Generation (LOADng), Clausen, T., Colin de Verdiere, A., Yi, J., Niktash, A., Igarashi, Y., Satoh, H., Herberg, U., Lavenu, C., Lys, T., C. Perkins, and J. Dean, October 2012"

::= { loadngRoutingSetEntry 4 }

loadngRoutingSetNextIpAddress OBJECT-TYPE

SYNTAX InetAddress (SIZE(4|16))

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"loadngRoutingSetNextIpAddress is the address of the next hop on the selected route to the destination."

REFERENCE

"RFC XXXX - The Lightweight On-demand Ad hoc Distance-vector Routing Protocol - Next Generation (LOADng), Clausen, T., Colin de Verdiere, A., Yi, J., Niktash, A., Igarashi, Y., Satoh, H., Herberg, U., Lavenu, C., Lys, T., C. Perkins, and J. Dean, October 2012"

::= { loadngRoutingSetEntry 5 }

loadngRoutingSetMetric OBJECT-TYPE

SYNTAX Unsigned32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"loadngRoutingSetMetric is the metric associated with the selected route to the destination with address R_dest_addr."

REFERENCE

"RFC XXXX - The Lightweight On-demand Ad hoc Distance-vector Routing Protocol - Next Generation (LOADng),

Clausen, T., Colin de Verdiere, A., Yi, J., Niktash, A.,
Igarashi, Y., Satoh, H., Herberg, U., Lavenu, C.,
Lys, T., C. Perkins, and J. Dean, October 2012"
::= { loadngRoutingSetEntry 6 }

loadngRoutingSetMetricType OBJECT-TYPE
SYNTAX Integer32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"loadngRoutingSetMetricType specifies the metric
type for this Routing Tuple - in other words, how
R_metric is defined and calculated."
REFERENCE
"RFC XXXX - The Lightweight On-demand Ad hoc
Distance-vector Routing Protocol - Next Generation (LOADng),
Clausen, T., Colin de Verdiere, A., Yi, J., Niktash, A.,
Igarashi, Y., Satoh, H., Herberg, U., Lavenu, C.,
Lys, T., C. Perkins, and J. Dean, October 2012"
::= { loadngRoutingSetEntry 8 }

loadngRoutingSetHopCount OBJECT-TYPE
SYNTAX Integer32 (0..255)
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"loadngRoutingSetHopCount is the hop count of the
selected route to the destination with address
R_dest_addr."
REFERENCE
"RFC XXXX - The Lightweight On-demand Ad hoc
Distance-vector Routing Protocol - Next Generation (LOADng),
Clausen, T., Colin de Verdiere, A., Yi, J., Niktash, A.,
Igarashi, Y., Satoh, H., Herberg, U., Lavenu, C.,
Lys, T., C. Perkins, and J. Dean, October 2012"
::= { loadngRoutingSetEntry 9 }

loadngRoutingSetSeqnum OBJECT-TYPE
SYNTAX Integer32 (-1..65535)
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"loadngRoutingSetSeqnum is the value of the
<seq-num> field of the RREQ or RREP which installed
or last updated this tuple. For the routing
tuples installed by previous hop information of
RREQ or RREP, loadngRoutingSetSeqnum must be

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set to -1."

REFERENCE

"RFC XXXX - The Lightweight On-demand Ad hoc
Distance-vector Routing Protocol - Next Generation (LOADng),
Clausen, T., Colin de Verdiere, A., Yi, J., Niktash, A.,
Igarashi, Y., Satoh, H., Herberg, U., Lavenu, C.,
Lys, T., C. Perkins, and J. Dean, October 2012"

::= { loadngRoutingSetEntry 10 }

loadngRoutingSetValidTime OBJECT-TYPE

SYNTAX TimeStamp

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"loadngRoutingSetValidTime specifies the value
of sysUptime when this entry should expire and be
removed from the loadngRoutingSetTable."

REFERENCE

"RFC XXXX - The Lightweight On-demand Ad hoc
Distance-vector Routing Protocol - Next Generation (LOADng),
Clausen, T., Colin de Verdiere, A., Yi, J., Niktash, A.,
Igarashi, Y., Satoh, H., Herberg, U., Lavenu, C.,
Lys, T., C. Perkins, and J. Dean, October 2012"

::= { loadngRoutingSetEntry 11 }

loadngRoutingSetBidirectional OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"loadngRoutingSetBidirectional is a boolean
flag, which specifies if the routing tuple
is verified as representing a bi-directional
route. Data traffic should only be routed
through a routing tuple with R_bidirectional
flag equals 'true', unless the router is
configured as accepting routes without
bi-directionality verification explicitly by
setting the USE_BIDIRECTIONAL_LINK_ONLY to 'false'."

REFERENCE

"RFC XXXX - The Lightweight On-demand Ad hoc
Distance-vector Routing Protocol - Next Generation (LOADng),

Clausen, T., Colin de Verdiere, A., Yi, J., Niktash, A.,
Igarashi, Y., Satoh, H., Herberg, U., Lavenu, C.,
Lys, T., C. Perkins, and J. Dean, October 2012"
::= { loadngRoutingSetEntry 12 }

loadngRoutingSetLocalIfaceIpAddressType OBJECT-TYPE
SYNTAX InetAddressType
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The type of the loadngRoutingSetLocalIfaceIpAddress
in the InetAddress MIB ([RFC 4001](#)).

Only the values 'ipv4(1)' and
'ipv6(2)' are supported."
REFERENCE
"RFC XXXX - The Lightweight On-demand Ad hoc
Distance-vector Routing Protocol - Next Generation (LOADng),
Clausen, T., Colin de Verdiere, A., Yi, J., Niktash, A.,
Igarashi, Y., Satoh, H., Herberg, U., Lavenu, C.,
Lys, T., C. Perkins, and J. Dean, October 2012"
::= { loadngRoutingSetEntry 13 }

loadngRoutingSetLocalIfaceIpAddress OBJECT-TYPE
SYNTAX InetAddress (SIZE(4|16))
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"loadngRoutingSetLocalIfaceIpAddress is the address
of the local interface, through which the
destination can be reached."
REFERENCE
"RFC XXXX - The Lightweight On-demand Ad hoc
Distance-vector Routing Protocol - Next Generation (LOADng),
Clausen, T., Colin de Verdiere, A., Yi, J., Niktash, A.,
Igarashi, Y., Satoh, H., Herberg, U., Lavenu, C.,
Lys, T., C. Perkins, and J. Dean, October 2012"
::= { loadngRoutingSetEntry 14 }

-- Pending Acknowledgment Set

--

loadngPendingAckSetTable OBJECT-TYPE

SYNTAX SEQUENCE OF LoadngPendingAckSetEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"The Pending Acknowledgment Set contains information about RREPs which have been transmitted with the ackrequired flag set, and for which an RREP_ACK has not yet been

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received. It consists of Pending Acknowledgment Tuples."

REFERENCE

"RFC XXXX - The Lightweight On-demand Ad hoc Distance-vector Routing Protocol - Next Generation (LOADng), Clausen, T., Colin de Verdiere, A., Yi, J., Niktash, A., Igarashi, Y., Satoh, H., Herberg, U., Lavenu, C., Lys, T., C. Perkins, and J. Dean, October 2012"

::= { loadngStateObjGrp 4 }

loadngPendingAckSetEntry OBJECT-TYPE

SYNTAX LoadngPendingAckSetEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"A router's Pending Acknowledgment Set consists of Pending Acknowledgment Tuples:

(P_next_hop, P_originator, P_seq_num, P_ack_timeout)"

REFERENCE

"RFC XXXX - The Lightweight On-demand Ad hoc Distance-vector Routing Protocol - Next Generation (LOADng), Clausen, T., Colin de Verdiere, A., Yi, J., Niktash, A., Igarashi, Y., Satoh, H., Herberg, U., Lavenu, C., Lys, T., C. Perkins, and J. Dean, October 2012"

INDEX { loadngPendingAckSetIndex }

::= { loadngPendingAckSetTable 1 }

```

LoadngPendingAckSetEntry ::=
    SEQUENCE {
        loadngPendingAckSetIndex
            Integer32,
        loadngPendingAckSetNextIpAddressType
            InetAddressType,
        loadngPendingAckSetNextIpAddress
            InetAddress,
        loadngPendingAckSetOrigIpAddressType
            InetAddressType,
        loadngPendingAckSetOrigIpAddress
            InetAddress,
        loadngPendingAckSetSeqnum
            Integer32,
        loadngPendingAckSetValidTime
            TimeStamp
    }

```

loadngPendingAckSetIndex OBJECT-TYPE

```

SYNTAX      Integer32 (0..65535)
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
    "The index for this table."
REFERENCE
    "RFC XXXX - The Lightweight On-demand Ad hoc
    Distance-vector Routing Protocol - Next Generation (LOADng),
    Clausen, T., Colin de Verdiere, A., Yi, J., Niktash, A.,
    Igarashi, Y., Satoh, H., Herberg, U., Lavenu, C.,
    Lys, T., C. Perkins, and J. Dean, October 2012"
::= { loadngPendingAckSetEntry 1 }

```

```

loadngPendingAckSetNextIpAddressType OBJECT-TYPE
    SYNTAX      InetAddressType
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The type of the loadngPendingAckSetNextIpAddress
        in the InetAddress MIB (RFC 4001)."

        Only the values 'ipv4(1)' and

```

'ipv6(2)' are supported."

REFERENCE

"RFC XXXX - The Lightweight On-demand Ad hoc Distance-vector Routing Protocol - Next Generation (LOADng), Clausen, T., Colin de Verdiere, A., Yi, J., Niktash, A., Igarashi, Y., Satoh, H., Herberg, U., Lavenu, C., Lys, T., C. Perkins, and J. Dean, October 2012"

::= { loadngPendingAckSetEntry 2 }

loadngPendingAckSetNextIpAddress OBJECT-TYPE

SYNTAX InetAddress (SIZE(4|16))

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"loadngPendingAckSetNextIpAddress is the address of the neighbor interface to which the RREP was sent. "

REFERENCE

"RFC XXXX - The Lightweight On-demand Ad hoc Distance-vector Routing Protocol - Next Generation (LOADng), Clausen, T., Colin de Verdiere, A., Yi, J., Niktash, A., Igarashi, Y., Satoh, H., Herberg, U., Lavenu, C., Lys, T., C. Perkins, and J. Dean, October 2012"

::= { loadngPendingAckSetEntry 3 }

loadngPendingAckSetOrigIpAddressType OBJECT-TYPE

SYNTAX InetAddressType

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The type of the loadngPendingAckSetOrigIpAddress in the InetAddress MIB ([RFC 4001](#)).

Only the values 'ipv4(1)' and 'ipv6(2)' are supported."

REFERENCE

"RFC XXXX - The Lightweight On-demand Ad hoc Distance-vector Routing Protocol - Next Generation (LOADng), Clausen, T., Colin de Verdiere, A., Yi, J., Niktash, A., Igarashi, Y., Satoh, H., Herberg, U., Lavenu, C., Lys, T., C. Perkins, and J. Dean, October 2012"

::= { loadngPendingAckSetEntry 4 }

loadngPendingAckSetOrigIpAddress OBJECT-TYPE

SYNTAX InetAddress (SIZE(4|16))

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"loadngPendingAckSetOrigIpAddress is the address
of the originator of the RREP."

REFERENCE

"RFC XXXX - The Lightweight On-demand Ad hoc
Distance-vector Routing Protocol - Next Generation (LOADng),
Clausen, T., Colin de Verdiere, A., Yi, J., Niktash, A.,
Igarashi, Y., Satoh, H., Herberg, U., Lavenu, C.,
Lys, T., C. Perkins, and J. Dean, October 2012"

::= { loadngPendingAckSetEntry 5 }

loadngPendingAckSetSeqnum OBJECT-TYPE

SYNTAX Integer32 (0..65535)

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"loadngPendingAckSetSeqnum corresponds to the
<seq-num> field of the sent RREP."

REFERENCE

"RFC XXXX - The Lightweight On-demand Ad hoc
Distance-vector Routing Protocol - Next Generation (LOADng),
Clausen, T., Colin de Verdiere, A., Yi, J., Niktash, A.,
Igarashi, Y., Satoh, H., Herberg, U., Lavenu, C.,
Lys, T., C. Perkins, and J. Dean, October 2012"

::= { loadngPendingAckSetEntry 6 }

loadngPendingAckSetValidTime OBJECT-TYPE

SYNTAX TimeStamp

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"loadngPendingAckSetValidTime specifies the value
of sysUptime when this entry should expire and be
removed from the loadngPendingAckSetTable."

REFERENCE

"RFC XXXX - The Lightweight On-demand Ad hoc
Distance-vector Routing Protocol - Next Generation (LOADng),
Clausen, T., Colin de Verdiere, A., Yi, J., Niktash, A.,
Igarashi, Y., Satoh, H., Herberg, U., Lavenu, C.,
Lys, T., C. Perkins, and J. Dean, October 2012"

::= { loadngPendingAckSetEntry 7 }

--

-- loadngConformance information

--

loadngCompliances OBJECT IDENTIFIER ::= { loadngConformance 1 }

loadngMIBGroups OBJECT IDENTIFIER ::= { loadngConformance 2 }

-- Compliance Statements

loadngBasicCompliance MODULE-COMPLIANCE

STATUS current

DESCRIPTION

"The basic implementation requirements for
managed network entities that implement
LOADng."

MODULE -- this module

MANDATORY-GROUPS { loadngConfigurationGroup }

::= { loadngCompliances 1 }

loadngFullCompliance MODULE-COMPLIANCE

STATUS current

DESCRIPTION

"The full implementation requirements for
managed network entities that implement
LOADng."

MODULE -- this module

MANDATORY-GROUPS { loadngConfigurationGroup,
 loadngStateGroup }

::= { loadngCompliances 2 }

--

-- Units of Conformance
--

```
loadngConfigurationGroup OBJECT-GROUP
  OBJECTS {
    loadngNetTraversalTime,
    loadngRREQRetries,
    loadngRREQRateLimit,
    loadngRHoldTime,
    loadngMaxDist,
    loadngBHoldTime,
    loadngRREPAckRequired,
    loadngRREPAckTimeout,
    loadngUseBidirectionalLinkOnly,
    loadngRreqMaxJitter,
    loadngMaxHopCount,
    loadngIfRowStatus,
    loadngLibLocalIfSetIfIndex,
    loadngLibLocalIfSetIpAddressType,
    loadngLibLocalIfSetRowStatus
  }
  STATUS current
  DESCRIPTION
    "Set of LOADng configuration objects implemented
    in this module."
 ::= { loadngMIBGroups 2 }
```

```
loadngStateGroup OBJECT-GROUP
  OBJECTS {
    loadngUpTime,
    loadngBlacklistedNeighborSetIpAddressType,
    loadngBlacklistedNeighborSetIpAddress,
    loadngBlacklistedNeighborSetBTime,
    loadngRoutingSetDestIpAddressType,
    loadngRoutingSetDestIpAddress,
    loadngRoutingSetNextIpAddressType,
    loadngRoutingSetNextIpAddress,
    loadngRoutingSetMetric,
    loadngRoutingSetMetricType,
    loadngRoutingSetHopCount,
    loadngRoutingSetSeqnum,
    loadngRoutingSetValidTime,
    loadngRoutingSetBidirectional,
    loadngRoutingSetLocalIfaceIpAddressType,
    loadngRoutingSetLocalIfaceIpAddress,
    loadngPendingAckSetNextIpAddressType,
    loadngPendingAckSetNextIpAddress,
```

```
        loadngPendingAckSetOrigIpAddressType,
        loadngPendingAckSetOrigIpAddress,
        loadngPendingAckSetSeqnum,
        loadngPendingAckSetValidTime,
        loadngLibLocalIfSetIpAddress,
        loadngLibDestAddressSetIpAddress,
        loadngLibDestAddressSetIpAddressType
    }
    STATUS    current
    DESCRIPTION
        "Set of LOADng state objects implemented
        in this module."
    ::= { loadngMIBGroups 3 }
```

END

8. Security Considerations

This MIB module defines objects for the configuration and monitoring of LOADng [[LOADng](#)].

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

- o loadngNetTraversalTime - this writable object controls the maximum time that a packet is expected to take when traversing from one end of the network to the other. If set too low, a router will not wait long enough until receiving an RREP as response to an RREQ. Therefore, all route requests may fail and render LOADng useless.
- o loadngRREQRetries - this writable object controls how many RREQs may be sent until an RREP must have been received or the route discovery is considered failed. If set too low in very lossy networks, route discovery may fail for destinations (which otherwise would have succeeded, had the value been higher). If set too high, a router may send unnecessary many RREQs, draining energy from the router and consuming bandwidth.
- o loadngRREQRateLimit - this writable object controls how many RREQs

may be sent per second. If set too high, a malicious node (host or router) may request routes for many destinations, resulting in

many RREQs, which drain energy from the router and consume bandwidth.

- o loadngRHoldTime - this writable object controls how long a Routing Tuple is hold in the Routing Set. If set too low, a router may not keep routes long enough, and may therefore frequently rediscover the same routes to a destination, resulting in bandwidth consumption and energy drain.
- o loadngRREPAckTimeout - this writable object controls how long a router waits before expecting an RREP_ACK. If set too low, and if RREP_ACKs are required, the router may list the neighbor as unidirectional and may therefore not use it for routing.
- o loadngBHoldTime - this writable object controls how long a Blacklisted Neighbor Tuples is hold in the Blacklisted Neighbor Set. If set too high, a neighbor router may be blocked for a long time, even though it may have become reachable bidirectionally in the meantime.
- o loadngRREPAckRequired - this writable object controls whether RREP_ACKs are required for verification of bidirectionality. If disabled in a lossy environment, and if bidirectionality is not verified by other means, unidirectional routes may be discovered to destinations.
- o loadngMaxDist - this writable object controls the maximum distance of a router in the routing domain. If set too low, destinations may be ignored to which otherwise a path could be established by LOADng.

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:

- o loadngRoutingSetTable - The table contains information on destinations in the routing domain, specifically their IP address in the loadngRoutingSetDestIpAddress object. This information provides an adversary broad information on the members of the routing domain, located within this single table. This information can be use to expedite attacks on the other members of the routing domain without having to go through a laborious discovery process on their own. This object is the index into the table, and has a MAX-ACCESS of 'not-accessible'. However, this

information can be exposed using SNMP operations.

MANET technology is often deployed to support communications of emergency services or military tactical applications. In these applications, it is imperative to maintain the proper operation of the communications network and to protect sensitive information related to its operation. Therefore, it is RECOMMENDED to provide support for the Transport Security Model (TSM) [[RFC5591](#)] in combination with TLS/DTLS [[RFC6353](#)].

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.

It is RECOMMENDED that implementations provide the security features described by the SNMPv3 framework (see [[RFC3410](#)]), including 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.

9. IANA Considerations

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

Descriptor -----	OBJECT IDENTIFIER value -----
OLSRv2-MIB	{ mib-2 XXXX }
IANA EDITOR NOTE: please assign XXXX	

10. Acknowledgements

This MIB document uses the template authored by D. Harrington which is based on contributions from the MIB Doctors, especially Juergen Schoenwaelder, Dave Perkins, C.M.Heard and Randy Presuhn.

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11. References

11.1. Normative References

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- [RFC2578] McCloghrie, K., Ed., Perkins, D., Ed., and J. Schoenwaelder, Ed., "Structure of Management Information Version 2 (SMIv2)", STD 58, [RFC 2578](#), April 1999.
- [RFC2579] McCloghrie, K., Ed., Perkins, D., Ed., and J. Schoenwaelder, Ed., "Textual Conventions for SMIv2", STD 58, [RFC 2579](#), April 1999.
- [RFC2580] McCloghrie, K., Perkins, D., and J. Schoenwaelder, "Conformance Statements for SMIv2", STD 58, [RFC 2580](#), April 1999.
- [RFC2863] McCloghrie, K. and F. Kastenholz, "The Interfaces Group MIB", [RFC 2863](#), June 2000.
- [RFC3418] Presuhn, R., "Management Information Base (MIB) for the Simple Network Management Protocol (SNMP)", STD 62, [RFC 3418](#), December 2002.

- [RFC4001] Daniele, M., Haberman, B., Routhier, S., and J. Schoenwaelder, "Textual Conventions for Internet Network Addresses", [RFC 4001](#), February 2005.
- [LOADng] Clausen, T., Colin de Verdiere, A., Niktash, A., Igarashi, Y., Satoh, H., Herberg, U., Lavenu, C., Lys, T., Perkins, C., and J. Dean, "The LLN On-demand Ad hoc Distance-vector Routing Protocol - Next Generation (LOADng)", work in progress [draft-clausen-lln-loadng-06](#), October 2012.

11.2. Informative References

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- [RFC3561] Perkins, C., Belding-Royer, E., and S. Das, "Ad hoc On-Demand Distance Vector (AODV) Routing", [RFC 3561](#), July 2003.
- [RFC3414] Blumenthal, U. and B. Wijnen, "User-based Security Model (USM) for version 3 of the Simple Network Management

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Protocol (SNMPv3)", STD 62, [RFC 3414](#), December 2002.

- [RFC3826] Blumenthal, U., Maino, F., and K. McCloghrie, "The Advanced Encryption Standard (AES) Cipher Algorithm in the SNMP User-based Security Model", [RFC 3826](#), June 2004.
- [RFC5591] Harrington, D. and W. Hardaker, "Transport Security Model for the Simple Network Management Protocol (SNMP)", [RFC 5591](#), June 2009.
- [RFC5592] Harrington, D., Salowey, J., and W. Hardaker, "Secure Shell Transport Model for the Simple Network Management Protocol (SNMP)", [RFC 5592](#), June 2009.
- [RFC6353] Hardaker, W., "Transport Layer Security (TLS) Transport Model for the Simple Network Management Protocol (SNMP)", [RFC 6353](#), July 2011.

Appendix A.

```
*****
* Note to the RFC Editor (to be removed prior to      *
* publication)                                         *
*                                                       *
* The reference to RFCXXXX within the DESCRIPTION clauses *
* of the MIB module point to this draft or to the LOADng *
* document and are to be assigned by the RFC Editor.    *
*****
```

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