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Definition of Managed Objects for the Lightweight On-demand Ad hoc
Distance-vector Routing Protocol - Next Generation (LOADng)
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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.

Status of This Memo

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The LOADng-MIB

January 2013

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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, January 2013.
```

```
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 "201301071000Z" -- 7 January 2013

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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 "201301071000Z" -- 7 January 2013
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,  
    loadngRreqMaxJitter  
      Unsigned32,  
    loadngRREPAckRequired  
      TruthValue,  
    loadngUseBidirectionalLinkOnly  
      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 }
```

```
loadngRreqMaxJitter  OBJECT-TYPE
```

SYNTAX Unsigned32
UNITS "milliseconds"
MAX-ACCESS read-create
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.

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 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 }

::= { loadngInterfaceEntry 2 }

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, January 2013"
DEFVAL { false }
::= { loadngInterfaceEntry 3 }

loadngUseBidirectionalLinkOnly OBJECT-TYPE
SYNTAX TruthValue
MAX-ACCESS read-create
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 on this interface.

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It is set by default. If cleared, then the LOADng
Router can use links which have not been verified to
be bi-directional on this interface.

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, January 2013"

DEFVAL { true }
::= { loadngInterfaceEntry 4 }

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, January 2013"

DEFVAL { 500 }

::= { loadngInterfaceEntry 5 }

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, 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, January 2013"

DEFVAL { active }
::= { loadngInterfaceEntry 6 }

--
-- 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, January 2013"
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, January 2013"
DEFVAL { 3 }
::= { loadngConfigurationObjGrp 3 }

```

```

loadngRREQMinInterval OBJECT-TYPE
    SYNTAX      Unsigned32
    UNITS       "milliseconds"
    MAX-ACCESS  read-write

```


STATUS current

DESCRIPTION

"loadngRREQMinInterval corresponds to RREQ_MIN_INTERVAL of LOADng. It represents the minimal interval of RREQs that a particular LOADng Router is allowed to send.

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, January 2013"

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, January 2013"

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, January 2013"

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."

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Igarashi, Y., Satoh, H., Herberg, U., Lavenu, C.,
Lys, T., C. Perkins, and J. Dean, January 2013"

DEFVAL { 15 }
::= { loadngConfigurationObjGrp 7 }

loadngMaxHopLimit OBJECT-TYPE

SYNTAX Unsigned32

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"loadngMaxHopLimit corresponds to
MAX_HOP_LIMIT of LOADng. It represents
the maximum limit of the number of hops that
LOADng routing messages are allowed to traverse.

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, January 2013"

DEFVAL { 255 }
::= { loadngConfigurationObjGrp 8 }

--

-- Local Interface Set Table

--

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

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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, January 2013"

::= { 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, January 2013"

```
INDEX { loadngLibLocalIfSetIndex, loadngLibLocalIfSetIfIndex }  
 ::= { loadngLibLocalIfSetTable 1 }
```

```
LoadngLibLocalIfSetEntry ::=  
  SEQUENCE {  
    loadngLibLocalIfSetIndex  
      Integer32,  
    loadngLibLocalIfSetIfIndex  
      InterfaceIndex,
```

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```
    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, January 2013"

```
::= { 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, January 2013"
 ::= { 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, January 2013"
 ::= { 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 loadngLibLocalIfSetIpAddrType."

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, January 2013"

::= { 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), 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, January 2013"

```

 ::= { 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, January 2013"
 ::= { 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, January 2013"

```

INDEX { loadngLibDestAddressSetIndex }
 ::= { loadngLibDestAddressSetTable 1 }

LoadngLibDestAddressSetEntry ::=
  SEQUENCE {
    loadngLibDestAddressSetIndex
      Integer32,
    loadngLibDestAddressSetIpAddressType
      InetAddressType,
    loadngLibDestAddressSetIpAddress
      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, January 2013"
  ::= { loadngLibDestAddressSetEntry 1 }

loadngLibDestAddressSetIpAddressType OBJECT-TYPE
  SYNTAX      InetAddressType
  MAX-ACCESS  read-write
  STATUS      current
  DESCRIPTION
    "The type of the loadngLibDestAddressSetIpAddress
     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, January 2013"
::= { loadngLibDestAddressSetEntry 2 }

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

        This object is interpreted according to
        the setting of loadngLibDestAddressSetIpAddressType."
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, January 2013"
::= { 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."

```

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```
::= { loadngStateObjGrp 1 }

--
-- Blacklisted Neighbor Set Table
--

loadngBlacklistedNeighborSetTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF LoadngBlacklistedNeighborSetEntry
    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, January 2013"
    ::= { 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

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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, January 2013"
INDEX { loadngBlacklistedNeighborSetIndex }
 ::= { loadngBlacklistedNeighborSetTable 1 }

LoadngBlacklistedNeighborSetEntry ::=
SEQUENCE {
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, January 2013"
 ::= { 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),
    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, January 2013"
 ::= { 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, January 2013"
 ::= { 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

Herberg, et al.

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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, January 2013"

::= { 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_bidirectional,
R_local_iface_addr, R_valid_time)"

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, January 2013"

```
INDEX { loadngRoutingSetIndex }  
::= { loadngRoutingSetTable 1 }
```

```
LoadngRoutingSetEntry ::=  
SEQUENCE {  
    loadngRoutingSetIndex  
        Integer32,  
    loadngRoutingSetDestIpAddressType  
        InetAddressType,  
    loadngRoutingSetDestIpAddress  
        InetAddress,  
    loadngRoutingSetNextIpAddressType  
        InetAddressType,  
    loadngRoutingSetNextIpAddress  
        InetAddress,  
    loadngRoutingSetMetric  
        Unsigned32,  
    loadngRoutingSetMetricType  
        Integer32,  
    loadngRoutingSetHopCount  
        Integer32,  
    loadngRoutingSetSeqnum  
        Integer32,  
    loadngRoutingSetBidirectional
```

```
        TruthValue,  
    loadngRoutingSetLocalIfaceIpAddressType  
        InetAddressType,  
    loadngRoutingSetLocalIfaceIpAddress  
        InetAddress,  
    loadngRoutingSetValidTime  
        TimeStamp  
}
```

```
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, January 2013"

::= { 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, January 2013"

::= { 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, January 2013"
 ::= { loadngRoutingSetEntry 3 }

loadngRoutingSetNextIpAddrType OBJECT-TYPE
SYNTAX InetAddressType
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The type of the loadngRoutingSetNextIpAddr
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, January 2013"

::= { loadngRoutingSetEntry 4 }

loadngRoutingSetNextIpAddr OBJECT-TYPE
SYNTAX InetAddress (SIZE(4|16))
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"loadngRoutingSetNextIpAddr 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, January 2013"

::= { 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, January 2013"
::= { 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, January 2013"
    ::= { 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, January 2013"
    ::= { loadngRoutingSetEntry 9 }

```

```

loadngRoutingSetSeqnum  OBJECT-TYPE

```

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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
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, January 2013"

::= { loadngRoutingSetEntry 10 }

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, January 2013"

::= { loadngRoutingSetEntry 11 }

loadngRoutingSetLocalIfaceIpAddrType OBJECT-TYPE

SYNTAX InetAddressType
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "The type of the loadngRoutingSetLocalIfaceIpAddr

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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, January 2013"

::= { loadngRoutingSetEntry 12 }

loadngRoutingSetLocalIfaceIpAddr OBJECT-TYPE

SYNTAX InetAddress (SIZE(4|16))
MAX-ACCESS read-only
STATUS current
DESCRIPTION

"loadngRoutingSetLocalIfaceIpAddr 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, January 2013"

::= { loadngRoutingSetEntry 13 }

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, January 2013"
 ::= { loadngRoutingSetEntry 14 }

--
-- Pending Acknowledgment Set
--

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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
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, January 2013"
 ::= { 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,
R_ack_received, 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, January 2013"

```
INDEX { loadngPendingAckSetIndex }  
 ::= { loadngPendingAckSetTable 1 }
```

LoadngPendingAckSetEntry ::=

```
SEQUENCE {  
    loadngPendingAckSetIndex  
        Integer32,  
    loadngPendingAckSetNextIpAddrType  
        InetAddressType,  
    loadngPendingAckSetNextIpAddr  
        InetAddress,  
    loadngPendingAckSetOrigIpAddrType  
        InetAddressType,
```

```
    loadngPendingAckSetOrigIpAddr  
        InetAddress,  
    loadngPendingAckSetSeqnum  
        Integer32,  
    loadngPendingAckSetAckReceived  
        TruthValue,  
    loadngPendingAckSetAckTimeout  
        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, January 2013"

```
::= { loadngPendingAckSetEntry 1 }
```

```
loadngPendingAckSetNextIpAddrType OBJECT-TYPE
```

```
SYNTAX      InetAddressType
```

```
MAX-ACCESS  read-only
```

```
STATUS      current
```

```
DESCRIPTION
```

```
"The type of the loadngPendingAckSetNextIpAddr  
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, January 2013"
```

```
::= { loadngPendingAckSetEntry 2 }
```

```
loadngPendingAckSetNextIpAddr OBJECT-TYPE
```

```
SYNTAX      InetAddress (SIZE(4|16))
```

```
MAX-ACCESS  read-only
```

```
STATUS      current
```

```
DESCRIPTION
```

```
"loadngPendingAckSetNextIpAddr 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, January 2013"
```

```
::= { loadngPendingAckSetEntry 3 }
```

```
loadngPendingAckSetOrigIpAddrType OBJECT-TYPE
```

```
SYNTAX      InetAddressType
```

```
MAX-ACCESS  read-only
```

```
STATUS      current
```

```
DESCRIPTION
```

"The type of the loadngPendingAckSetOrigIpAddr
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, January 2013"

::= { loadngPendingAckSetEntry 4 }

loadngPendingAckSetOrigIpAddr OBJECT-TYPE

SYNTAX InetAddress (SIZE(4|16))

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"loadngPendingAckSetOrigIpAddr 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, January 2013"

::= { 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, January 2013"
::= { loadngPendingAckSetEntry 6 }

loadngPendingAckSetAckReceived OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"loadngPendingAckSetAckReceived is a boolean flag,
which specifies the tuple has been acknowledged
by a corresponding RREP_ACK message."

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, January 2013"

::= { loadngPendingAckSetEntry 7 }

loadngPendingAckSetAckTimeout OBJECT-TYPE

SYNTAX TimeStamp

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"loadngPendingAckSetAckTimeout 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, January 2013"

::= { loadngPendingAckSetEntry 8 }

--

-- 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,
        loadngRREQMinInterval,
        loadngRHoldTime,
        loadngMaxDist,
        loadngBHoldTime,
        loadngRREPAckRequired,
        loadngRREPAckTimeout,
        loadngUseBidirectionalLinkOnly,
        loadngRreqMaxJitter,
        loadngMaxHopLimit,
        loadngIfRowStatus,
```

```
        loadngLibLocalIfSetIfIndex,
        loadngLibLocalIfSetIpAddrType,
        loadngLibLocalIfSetRowStatus
    }
    STATUS    current
    DESCRIPTION
        "Set of LOADng configuration objects implemented
        in this module."
 ::= { loadngMIBGroups 2 }

loadngStateGroup OBJECT-GROUP
    OBJECTS {
        loadngUpTime,
        loadngBlacklistedNeighborSetIpAddrType,
        loadngBlacklistedNeighborSetIpAddr,
        loadngBlacklistedNeighborSetBTime,
        loadngRoutingSetDestIpAddrType,
        loadngRoutingSetDestIpAddr,
        loadngRoutingSetNextIpAddrType,
        loadngRoutingSetNextIpAddr,
        loadngRoutingSetMetric,
        loadngRoutingSetMetricType,
        loadngRoutingSetHopCount,
        loadngRoutingSetSeqnum,
        loadngRoutingSetBidirectional,
        loadngRoutingSetLocalIfaceIpAddrType,
        loadngRoutingSetLocalIfaceIpAddr,
        loadngRoutingSetValidTime,
        loadngPendingAckSetNextIpAddrType,
        loadngPendingAckSetNextIpAddr,
        loadngPendingAckSetOrigIpAddrType,
        loadngPendingAckSetOrigIpAddr,
        loadngPendingAckSetSeqnum,
        loadngPendingAckSetAckReceived,
        loadngPendingAckSetAckTimeout,
        loadngLibLocalIfSetIpAddr,
        loadngLibDestAddressSetIpAddr,
        loadngLibDestAddressSetIpAddrType
    }
    STATUS    current
    DESCRIPTION
        "Set of LOADng state objects implemented
        in this module."
 ::= { loadngMIBGroups 3 }
```

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 loadngRREQMinInterval- this writable object controls the minimum interval between two successive RREQs. If set too low, 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
-----	-----
LOADng-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.

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.
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- [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 Lightweight On-demand Ad hoc Distance-vector Routing Protocol - Next Generation (LOADng)", work in progress [draft-clausen-lln-loadng-07](#),

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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 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)",

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[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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