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**Definition of Managed Objects for the Manet Simplified Multicast  
Framework Relay Set Process  
draft-ietf-manet-smf-mib-08**

**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 aspects of the Simplified Multicast Forwarding (SMF) process for Mobile Ad-Hoc Networks (MANETs). The SMF-MIB also reports state information, performance metrics, and notifications. In addition to configuration, the additional state and performance information is useful to operators troubleshooting multicast forwarding problems.

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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 aspects of a process implementing Simplified Multicast Forwarding (SMF) [[RFC6621](#)] for Mobile Ad-Hoc Networks (MANETs). SMF provides multicast Duplicate Packet Detection (DPD) and supports algorithms for constructing an estimate of a MANET Minimum Connected Dominating Set (MCDS) for efficient multicast forwarding. The SMF-MIB also reports state information, performance information, and notifications. In addition to configuration, this additional state and performance information is useful to operators troubleshooting multicast forwarding problems.

## **2. The Internet-Standard Management Framework**

For a detailed overview of the documents that describe the current Internet-Standard Management Framework, please refer to [section 7 of RFC 3410](#) [[RFC3410](#)].

Managed objects are accessed via a virtual information store, termed the Management Information Base or MIB. MIB objects are generally accessed through the Simple Network Management Protocol (SNMP). Objects in the MIB are defined using the mechanisms defined in the Structure of Management Information (SMI). This memo specifies a MIB module that is compliant to the SMIv2, which is described in STD 58, [RFC 2578](#) [[RFC2578](#)], STD 58, [RFC 2579](#) [[RFC2579](#)] and STD 58, [RFC 2580](#) [[RFC2580](#)].

## **3. Conventions**

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [RFC 2119](#) [[RFC2119](#)].

## **4. Overview**

SMF provides methods for implementing Duplicate Packet Detection (DPD)-based multicast forwarding with the optional use of Connected Dominating Set (CDS)-based relay sets. The CDS provides a complete connected coverage of the nodes comprising the MANET. The Minimum CDS (MCDS) is the smallest set of MANET nodes (comprising a connected cluster) which cover all the nodes in the cluster with their transmissions. As the density of the MANET nodes increase, the fraction of nodes required in an MCDS decreases. Using the MCDS as a multicast forwarding set then becomes an efficient multicast mechanism for MANETs.



Various algorithms for the construction of estimates of the MCDS exist. The Simplified Multicast Framework [[RFC6621](#)] describes some of these. It further defines various operational modes for a node which is participating in the collective creation of the MCDS estimates. These modes depend upon the set of related MANET routing and discovery protocols and mechanisms in operation in the specific MANET node.

A SMF router's MIB contains SMF process configuration parameters (e.g. specific CDS algorithm), state information (e.g., current membership in the CDS), performance counters (e.g., packet counters), and notifications.

#### **4.1. SMF Management Model**

This section describes the management model for the SMF node process.

Figure 1 (reproduced from Figure 4 of [[RFC6621](#)]) shows the relationship between the SMF Relay Set selection algorithm and the related algorithms, processes and protocols running in the MANET nodes. The Relay Set Selection Algorithm (RSSA) can rely upon topology information gotten from the MANET Neighborhood Discovery Protocol (NHDP), from the specific MANET routing protocol running on the node, or from Layer 2 information passed up to the higher layer protocol processes.



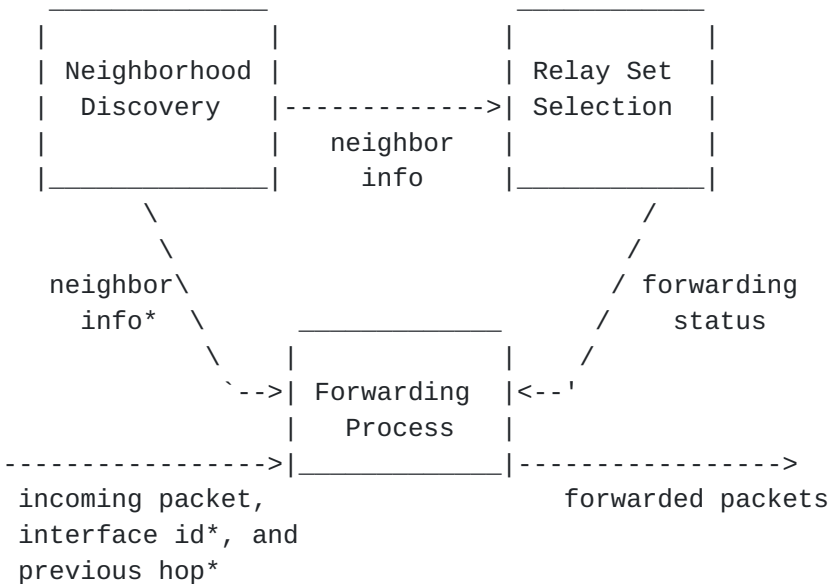


Figure 1: SMF Router Architecture

#### 4.2. 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 interfaces such as defined by this MIB.
- o Tunable Configuration Objects - objects whose values affect timing or attempt bounds on the SMF Relay Set (RS) process.
- o State Objects - automatically generated values which define the current operating state of the SMF RS process in the router.
- o Performance Objects - automatically generated values which help an administrator or automated tool to assess the performance of the CDS multicast process on the router and the overall multicast performance within the MANET routing domain.

#### 5. Structure of the MIB Module

This section presents the structure of the SMF-MIB module. The objects are arranged into the following groups:

- o smfMIBNotifications - defines the notifications associated with the SMF process.





- o smfMIBObjects - defines the objects forming the basis for the SMF-MIB. These objects are divided up by function into the following groups:
  - \* Capabilities Group - This group contains the SMF objects that the device uses to advertise its local capabilities with respect to, e.g., the supported RSSAs.
  - \* Configuration Group - This group contains the SMF objects that configure specific options that determine the overall operation of the SMF process and the resulting multicast performance.
  - \* State Group - Contains information describing the current state of the SMF process such as the Neighbor Table.
  - \* Performance Group - Contains objects which help to characterize the performance of the SMF process, typically counters for statistical computations.
- o smfMIBConformance - defines two, i.e., minimal and full, conformance implementations for the SMF-MIB.

### **5.1. Textual Conventions**

The textual conventions defined within the SMF-MIB are:

- o The SmfStatus is defined within the SMF-MIB. This contains the current operational status of the SMF process on an interface.
- o The SmfOpModeID represents an index that identifies a specific SMF operational mode.
- o The SmfRssaID represents an index that identifies, through reference, a specific RSSA available for operation on the device.

### **5.2. The Capabilities Group**

The SMF device supports a set of capabilities. The list of capabilities which the device can advertise are:

- o Operational Mode - topology information from NHDP, CDS-aware unicast routing or Cross-layer from Layer 2.
- o SMF RSSA - the specific RSSA operational on the device. Note that configuration, state and performance objects related to a specific RSSA must be defined within a separate MIB.



### **5.3. The Configuration Group**

The SMF device is configured with a set of controls. Some of the prominent configuration controls for the SMF device are:

- o Operational Mode - determines where topology information is derived from, e.g., NHDP, CDS-aware unicast routing or Cross-layer from Layer 2.
- o SMF RSSA - the specific RSSA operational on the device.
- o Duplicate Packet detection for IPv4 - Identification-based or Hash-based DPD.
- o Duplicate Packet detection for IPv6 - Identification-based or Hash-based DPD.
- o SMF Type Message TLV - if NHDP mode is selected, then the SMF Type Message TLV MAY be included in the NHDP exchanges.
- o SMF Address Block TLV - if NHDP mode is selected, then the SMF Address Block TLV SHOULD be included in the NHDP exchanges.

### **5.4. The State Group**

The State sub-tree reports current state information, e.g.,

- o Node RSSA State - identifies whether the node is currently in or out of the Relay Set.
- o Neighbors Table - a table containing current one-hop neighbors and their operational RSSA.

### **5.5. The Performance Group**

The Performance sub-tree reports primarily counters that relate to SMF RSSA performance. The SMF performance counters consists of per node and per interface objects:

- o Total multicast packets received.
- o Total multicast packets forwarded.
- o Total duplicate multicast packets detected.
- o Per interface statistics table with the following entries:



- \* Multicast packets received.
- \* Multicast packets forwarded.
- \* Duplicate multicast packets detected.

#### **5.6. The Notifications Group**

The Notifications Sub-tree contains the list of notifications supported within the SMF-MIB and their intended purpose and utility.

#### **5.7. Tables and Indexing**

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

- o configuration and operation of packet forwarding on the local router,
- o configuration and operation of local MANET interfaces on the router, and
- o configuration and operation of various RSSA algorithms for packet forwarding.

The SMF-MIB module's tables are indexed via the following constructs:

- o smfOpModeCapabilitiesID - the index identifying the SMF modes.
- o smfRssaCapabilitiesID - the index identifying the RSSAs supported by this specific device.
- o smfConfiguredAddrForwardingAddrType and smfConfiguredAddrForwardingFirstAddr - indexes to configured multicast addresses which are forwarded by the SMF process.
- o smfIfIndex - the IfIndex of the interface on the local router on which SMF is configured.
- o smfDiscoveredAddrForwardingAddrType and smfDiscoveredAddrForwardingFirstAddr - indexes to discovered multicast addresses which are forwarded by the SMF process.
- o smfNeighborIpAddrType, smfNeighborIpAddr, and smfNeighborPrefixLen - the interface index set of specific one-hop neighbor nodes to this local router.

These tables and their associated indexing are:



- o smfOpModeCapabilitiesTable - identifies the resident set of SMF Operational Modes on this router. This table has 'INDEX { smfOpModeCapabilitiesID }'.
- o smfRssaCapabilitiesTable - contains reference to the specific set of RSSAs currently supported on this device. This table has 'INDEX { smfRssaCapabilitiesID }'.
- o smfConfiguredAddrForwardingTable - contains information on multicast addresses which are to be forwarded by the SMF process on this device. This table has 'INDEX { smfConfiguredAddrForwardingAddrType, smfConfiguredAddrForwardingFirstAddr, smfConfiguredAddrForwardingLastAddr }'.
- o smfInterfaceTable - describes the SMF interfaces on this device that are participating in the SMF packet forwarding process. This table has 'INDEX { smfIfIndex }'.
- o smfDiscoveredAddrForwardingTable - contains discovered address for SMF packet forwarding. This table has 'INDEX { smfDiscoveredAddrForwardingAddrType, smfDiscoveredAddrForwardingFirstAddr }'.
- o smfNeighborTable - describes the current neighbor nodes, their addresses and the SMF RSSA and the interface on which they can be reached. This table has 'INDEX { smfNeighborIpAddrType, smfNeighborIpAddr, smfNeighborPrefixLen }'.
- o smfIpv4InterfaceTable - contains the IPv4 related SMF statistics per each SMF interface on this device. This table has 'INDEX { smfIfIndex }'.
- o smfIpv6InterfaceTable - contains the IPv6 related SMF statistics per each SMF interface on this device. This table has 'INDEX { smfIfIndex }'.

## **6. Relationship to Other MIB Modules**

### **6.1. Relationship to the SNMPv2-MIB**

The 'system' group in the SNMPv2-MIB [[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 SMF-MIB does not duplicate those objects.





## 6.2. MIB modules required for IMPORTS

The textual conventions imported for use in the SMF-MIB are as follows. The MODULE-IDENTITY, OBJECT-TYPE, NOTIFICATION-TYPE, Counter32, Unsigned32, Integer32 and mib-2 textual conventions are imported from [RFC 2578](#) [[RFC2578](#)]. The TEXTUAL-CONVENTION, RowStatus and TruthValue textual conventions are imported from [RFC 2579](#) [[RFC2579](#)]. The MODULE-COMPLIANCE, OBJECT-GROUP and NOTIFICATION-GROUP textual conventions are imported from [RFC 2580](#) [[RFC2580](#)]. The InterfaceIndexOrZero textual convention is imported from [RFC 2863](#) [[RFC2863](#)]. The SnmpAdminString textual convention is imported from [RFC 3411](#) [[RFC3411](#)]. The InetAddress, InetAddressType and InetAddressPrefixLength textual conventions are imported from [RFC 4001](#) [[RFC4001](#)].

## 6.3. Relationship to the Future RSSA-MIBs

In a sense, the SMF-MIB is a general front-end to a set of, yet to be developed, RSSA-specific MIBs. These RSSA-specific MIBs will define the objects for the configuration, state, performance and notification required for the operation of these specific RSSAs. The SMF-MIB Capabilities Group allows the remote management station the ability to query the router to discover the set of supported RSSAs.

## 7. Definitions

```
SMF-MIB DEFINITIONS ::= BEGIN
```

```
IMPORTS
```

```
    MODULE-IDENTITY, OBJECT-TYPE, NOTIFICATION-TYPE,  
    Counter32, Integer32, TimeTicks, experimental  
        FROM SNMPv2-SMI -- [RFC2578]
```

```
    TEXTUAL-CONVENTION, RowStatus, TruthValue,  
    DisplayString  
        FROM SNMPv2-TC -- [RFC2579]
```

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

```
    InterfaceIndexOrZero  
        FROM IF-MIB -- [RFC2863]
```

```
    SnmpAdminString
```



```
FROM SNMP-FRAMEWORK-MIB -- [RFC3411]

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

smfMIB MODULE-IDENTITY
LAST-UPDATED "201309011300Z" -- September 01, 2013
ORGANIZATION "IETF MANET Working Group"
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```

#### DESCRIPTION

"This MIB module contains managed object definitions for the Manet SMF RSSA process defined in:

[SMF] Macker, J.(ed.),  
Simplified Multicast Forwarding, [RFC 6621](#),  
May 2012.

Copyright (C) The IETF Trust (2012). This version  
of this MIB module is part of RFC xxxx; see the RFC



```
        itself for full legal notices."

-- Revision History
REVISION      "201309011300Z"    -- September 01, 2013
DESCRIPTION
    "The first version of this MIB module,
      published as RFC xxxx.
    "
-- RFC-Editor assigns xxxx
::= { experimental xxxx }    -- to be assigned by IANA


--
-- TEXTUAL CONVENTIONS
--

SmfStatus ::= TEXTUAL-CONVENTION
    STATUS      current
    DESCRIPTION
        "An indication of the operability of a SMF
        function or feature.  For example, the status
        of an interface: 'enabled' indicates that
        this interface is performing SMF functions,
        and 'disabled' indicates that it is not.
        Similarly for the status of the device:
        'enabled' indicates that the device has
        enabled the SMF functions on the device and
        'disabled' means that the device and all interfaces
        have disabled all SMF functions."
    SYNTAX      INTEGER {
                                enabled (1),
                                disabled (2)
                            }

SmfOpModeID ::= TEXTUAL-CONVENTION
    STATUS      current
    DESCRIPTION
        "An index that identifies through reference to a specific
        SMF operations mode.  There are basically three styles
        of SMF operation with reduced relay sets:

            Independent operation 'independent(1)' -
                SMF performs its own relay
                set selection using information from an associated
                MANET NHDP process.

            CDS-aware unicast routing operation 'routing(2)' -
                a coexistent unicast routing
```



protocol provides dynamic relay  
set state based upon its own control plane  
CDS or neighborhood discovery information.

Cross-layer operation 'crossLayer(3)' -  
SMF operates using neighborhood  
status and triggers from a  
cross-layer information base for dynamic relay  
set selection and maintenance."

REFERENCE

"[RFC 6621](#) - Simplified Multicast Forwarding  
(SMF), Macker, J., May 2012."

SYNTAX INTEGER {  
    independent (1),  
    routing (2),  
    crossLayer (3)  
    -- future (4-255)  
}

SmfRssaID ::= TEXTUAL-CONVENTION

STATUS current

DESCRIPTION

"An index that identifies through reference to a specific  
RSSA algorithms. Several are currently defined  
in the appendix of [RFC 6621](#)."

REFERENCE

"[RFC 6621](#) - Simplified Multicast Forwarding  
(SMF), Macker, J., May 2012."

SYNTAX INTEGER {  
    cF(1),  
    SMPR(2),  
    eCDS(3),  
    mprCDS(4)  
    -- future(5-127)  
    -- noStdAction(128-239)  
    -- experimental(240-255)  
}

--

-- Top-Level Object Identifier Assignments

--

smfMIBNotifications OBJECT IDENTIFIER ::= { smfMIB 0 }  
smfMIBObjects OBJECT IDENTIFIER ::= { smfMIB 1 }  
smfMIBConformance OBJECT IDENTIFIER ::= { smfMIB 2 }





```
--
-- smfMIBObjects Assignments:
--     smfCapabilitiesGroup - 1
--     smfConfigurationGroup - 2
--     smfStateGroup - 3
--     smfPerformanceGroup - 4
--

--
-- smfCapabilitiesGroup
--
--     This group contains the SMF objects that identify specific
--     capabilities within this device related to SMF functions.
--

smfCapabilitiesGroup OBJECT IDENTIFIER ::= { smfMIBObjects 1 }

--
-- SMF Operational Mode Capabilities Table
--

smfOpModeCapabilitiesTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF SmfOpModeCapabilitiesEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The smfOpModeCapabilitiesTable identifies the
        resident set of SMF Operational Modes on this
        router."
    REFERENCE
        "RFC 6621 - Simplified Multicast Forwarding
        (SMF), Macker, J., May 2012."
    ::= { smfCapabilitiesGroup 1 }

smfOpModeCapabilitiesEntry OBJECT-TYPE
    SYNTAX      SmfOpModeCapabilitiesEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "Information about a particular operational
        mode.
        "
    INDEX      { smfOpModeCapabilitiesID }
    ::= { smfOpModeCapabilitiesTable 1 }

SmfOpModeCapabilitiesEntry ::= SEQUENCE {
    smfOpModeCapabilitiesID          SmfOpModeID,
    smfOpModeCapabilitiesName       SnmpAdminString,
```



```
        smfOpModeCapabilitiesReference      SnmpAdminString
    }
```

```
smfOpModeCapabilitiesID      OBJECT-TYPE
    SYNTAX      SmfOpModeID
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The index for this entry.  This object identifies
        the particular operational mode for this device."
    ::= { smfOpModeCapabilitiesEntry 1 }
```

```
smfOpModeCapabilitiesName OBJECT-TYPE
    SYNTAX      SnmpAdminString
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The textual name of this operational
        mode.  Current operational modes include:
        'independent',
        'routing', and
        'crossLayer' Mode.
        Others may be defined
        in future revisions of [SMF]."
    ::= { smfOpModeCapabilitiesEntry 2 }
```

```
smfOpModeCapabilitiesReference OBJECT-TYPE
    SYNTAX      SnmpAdminString
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "This object contains a reference to the document
        that defines this operational mode."
    ::= { smfOpModeCapabilitiesEntry 3 }
```

```
--
-- SMF RSSA Capabilities Table
--
```

```
smfRssaCapabilitiesTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF SmfRssaCapabilitiesEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The smfRssaCapabilitiesTable contains
        reference to the specific set of RSSAs
        currently supported on this device."
```



```
"
REFERENCE
  "RFC 6621 - Simplified Multicast Forwarding
    (SMF), Macker, J., May 2012."
  ::= { smfCapabilitiesGroup 2 }

smfRssaCapabilitiesEntry OBJECT-TYPE
  SYNTAX      SmfRssaCapabilitiesEntry
  MAX-ACCESS  not-accessible
  STATUS      current
  DESCRIPTION
    "Information about a particular RSSA
      algorithm.

      By default, the agent should support at least the
      Classical Flooding 'cF' algorithm. All compliant
      SMF forwarders must support Classical Flooding.
      Hence, at least one entry in this table must
      exist with the smfRssaCapabilitiesID indicating
      'cF'."
  INDEX      { smfRssaCapabilitiesID }
  ::= { smfRssaCapabilitiesTable 1 }

SmfRssaCapabilitiesEntry ::= SEQUENCE {
    smfRssaCapabilitiesID      SmfRssaID,
    smfRssaCapabilitiesName    SnmpAdminString,
    smfRssaCapabilitiesReference SnmpAdminString
}

smfRssaCapabilitiesID      OBJECT-TYPE
  SYNTAX      SmfRssaID
  MAX-ACCESS  not-accessible
  STATUS      current
  DESCRIPTION
    "The index for this entry. This object identifies
      the particular RSSA algorithm in this MIB
      module. Example RSSAs are found in the
      appendix of RFC 6621."
  REFERENCE
    "RFC 6621 - Simplified Multicast Forwarding
      (SMF), Macker, J., May 2012."
  ::= { smfRssaCapabilitiesEntry 1 }

smfRssaCapabilitiesName OBJECT-TYPE
  SYNTAX      SnmpAdminString
  MAX-ACCESS  read-only
  STATUS      current
  DESCRIPTION
```



```

    "The textual name of this RSSA algorithm.
    Currently defined names are:
        'cF',
        'sMPR',
        'eCDS',
        'mprCDS'.
    "
 ::= { smfRssaCapabilitiesEntry 2 }

smfRssaCapabilitiesReference OBJECT-TYPE
    SYNTAX      SnmpAdminString
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
        "This object contains a published reference
        to the document that defines this algorithm.
        "
 ::= { smfRssaCapabilitiesEntry 3 }

--
-- smfConfigurationGroup
--
--   This group contains the SMF objects that configure specific
--   options that determine the overall performance and operation
--   of the multicast forwarding process for the router device
--   and its interfaces.
--

smfConfigurationGroup  OBJECT IDENTIFIER ::= { smfMIBObjects 2 }

smfAdminStatus  OBJECT-TYPE
    SYNTAX      SmfStatus
    MAX-ACCESS   read-write
    STATUS       current
    DESCRIPTION
        "The configured status of the SMF process
        on this device.  'enabled(1)' means that
        SMF is configured to run on this device.
        'disabled(2)' mean that the SMF process
        is configured off.

        Prior to SNM functions being performed over
        specific interfaces, this object must first
        be 'enabled'.  If this object is 'disabled',
        then no SMF functions SHOULD be performed on
```





the device and all smfIfAdminStatus objects SHOULD also be set to 'disabled'. When this object is changed from 'enabled' to 'disabled', then all smfIfAdminStatus objects SHOULD also be set to 'disabled'.

The default value for this object SHOULD be 'enabled'.

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

DEFVAL { enabled }

::= { smfConfigurationGroup 1 }

smfRouterIDAddrType OBJECT-TYPE

SYNTAX InetAddressType { ipv4(1), ipv6(2) }

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"The address type of the address used for SMF ID of this router as specified in the 'smfRouterID' next.

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

This can be set by the management station, the smfRouterID must be a routable address assigned to this router. If the management station does not assign this value, then the router should choose the highest routable IP address assigned to this router.

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

DEFVAL { ipv4 }

::= { smfConfigurationGroup 2 }

smfRouterID OBJECT-TYPE

SYNTAX InetAddress (SIZE(4|16))

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"The IP address used as the SMF router ID. This can be set by the management station. If not explicitly set, then the device



should select a routable IP address assigned to this router for use as the 'smfRouterID'.

The smfRouterID is a logical identification that MUST be consistent across interoperable SMF neighborhoods and it is RECOMMENDED to be chosen as the numerically largest address contained in a node's 'Neighbor Address List' as defined in NHDP. A smfRouterID MUST be unique within the scope of the operating MANET network regardless of the method used for selecting it.

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

#### REFERENCE

"[RFC 6621](#) - Simplified Multicast Forwarding (SMF), Macker, J., May 2012."

::= { smfConfigurationGroup 3 }

#### smfConfiguredOpMode OBJECT-TYPE

SYNTAX SmfOpModeID

MAX-ACCESS read-write

STATUS current

#### DESCRIPTION

"The SMF RSS node operational mode as defined in the TEXTUAL CONVENTION for 'SmfOpModeID' and in this MIB module.

The default value for this object is 'independent(1)'.

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

#### REFERENCE

"[RFC 6621](#) - Simplified Multicast Forwarding (SMF), Macker, J., May 2012."

DEFVAL { independent }

::= { smfConfigurationGroup 4 }

#### smfConfiguredRssa OBJECT-TYPE

SYNTAX SmfRssaID

MAX-ACCESS read-write

STATUS current



## DESCRIPTION

"The SMF RSS currently operational algorithm as defined in the TEXTUAL CONVENTION for 'SmfRssaID' and in [RFC 6621](#).

The default value for this object is 'cF(1)', i.e., Classical Flooding.

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

## REFERENCE

"[RFC 6621](#) - Simplified Multicast Forwarding (SMF), Macker, J., May 2012."

DEFVAL { cF }

::= { smfConfigurationGroup 5 }

smfRssaMember OBJECT-TYPE

SYNTAX INTEGER {  
potential(1),  
always(2),  
never(3)  
}

MAX-ACCESS read-write

STATUS current

## DESCRIPTION

"The RSSA downselects a set of forwarders for multicast forwarding. Sometimes it is useful to force an agent to be included or excluded from the resulting RSS. This object is a switch to allow for this behavior.

The value 'potential(1)' allows the selected RSSA to determine if this agent is included or excluded from the RSS.

The value 'always(1)' forces the selected RSSA include this agent in the RSS.

The value 'never(3)' forces the selected RSSA to exclude this agent from the RSS.

The default setting for this object is 'potential(1)'. Other settings could pose operational risks under certain conditions.

This object is persistent and when written the entity SHOULD save the change to



```
        non-volatile storage."
REFERENCE
    "RFC 6621 - Simplified Multicast Forwarding
    (SMF), Macker, J., May 2012."
DEFVAL { potential }
::= { smfConfigurationGroup 6 }

smfIpv4Dpd OBJECT-TYPE
    SYNTAX      INTEGER {
                    hashBased(1),
                    identificationBased(2)
                }
    MAX-ACCESS   read-write
    STATUS       current
    DESCRIPTION
        "The current method for IPv4 duplicate packet
        detection.

        The value 'hashBased(1)' indicates that the
        routers duplicate packet detection is based
        upon comparing a hash over the packet fields.
        This is the default setting for this object.

        The value 'identificationBased(2)'
        indicates that the duplicate packet
        detection relies upon header information
        in the multicast packets to identify
        previously received packets.

        This object is persistent and when written
        the entity SHOULD save the change to
        non-volatile storage."
REFERENCE
    "RFC 6621 - Simplified Multicast Forwarding
    (SMF), Macker, J., May 2012."
DEFVAL { hashBased }
::= { smfConfigurationGroup 7 }

smfIpv6Dpd OBJECT-TYPE
    SYNTAX      INTEGER {
                    hashBased(1),
                    identificationBased(2)
                }
    MAX-ACCESS   read-write
    STATUS       current
    DESCRIPTION
        "The current method for IPv6 duplicate packet
        detection.
```





The values indicate the type of method used for duplicate packet detection as described the previous description for the object `smfIpv4Dpd'.

The default value for this object is 'hashBased(1)'.

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

#### REFERENCE

"[RFC 6621](#) - Simplified Multicast Forwarding (SMF), Macker, J., May 2012."

DEFVAL { hashBased }

::= { smfConfigurationGroup 8 }

#### smfMaxPktLifetime OBJECT-TYPE

SYNTAX Integer32 (0..65535)

UNITS "Seconds"

MAX-ACCESS read-write

STATUS current

#### DESCRIPTION

"The estimate of the network packet traversal time.

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

#### REFERENCE

"[RFC 6621](#) - Simplified Multicast Forwarding (SMF), Macker, J., May 2012."

DEFVAL { 60 }

::= { smfConfigurationGroup 9 }

#### smfDpdMaxMemorySize OBJECT-TYPE

SYNTAX Integer32 (0..65535)

UNITS "Kilo-Bytes"

MAX-ACCESS read-write

STATUS current

#### DESCRIPTION

"The locally reserved memory for storage of cached DPD records for both IPv4 and IPv6 methods.

The local SMF device should protect itself against the SNMP manager from requesting too large a memory value. If this is the case,



an error indication should be returned in response to the SNMP SET request.

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

REFERENCE

"[RFC 6621](#) - Simplified Multicast Forwarding (SMF), Macker, J., May 2012."

DEFVAL { 1024 }

::= { smfConfigurationGroup 10 }

smfDpdEntryMaxLifetime OBJECT-TYPE

SYNTAX Integer32 (0..65525)

UNITS "Seconds"

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"The maximum lifetime of a cached DPD record in the local device storage.

If the memory is running low prior to the MaxLifetimes being exceeded, the local SMF devices should purge the oldest records first.

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

REFERENCE

"[RFC 6621](#) - Simplified Multicast Forwarding (SMF), Macker, J., May 2012."

DEFVAL { 600 }

::= { smfConfigurationGroup 11 }

--

-- Configuration of messages to be included in  
-- NHDP message exchanges in support of SMF  
-- operations.

--

smfNhdpRssaMesgTLVIncluded OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"Indicates whether the associated NHDP messages include the RSSA Message TLV, or not. This



is an optional SMF operational setting.  
The value 'true(1)' indicates that this TLV is included; the value 'false(2)' indicates that it is not included.

It is RECOMMENDED that the RSSA Message TLV be included in the NHDP messages.

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

#### REFERENCE

"[RFC 6621](#) - Simplified Multicast Forwarding (SMF), Macker, J., May 2012."

DEFVAL { true }

::= { smfConfigurationGroup 12 }

smfNhdpRssaAddrBlockTLVIncluded OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-write

STATUS current

#### DESCRIPTION

"Indicates whether the associated NHDP messages include the RSSA Address Block TLV, or not.  
This is an optional SMF operational setting.  
The value 'true(1)' indicates that this TLV is included; the value 'false(2)' indicates that it is not included.

The smfNhdpRssaAddrBlockTLVIncluded is optional in all cases as it depends on the existence of an address block which may not be present.  
If this SMF device is configured with NHDP, then this object SHOULD be set to 'true(1)'.

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

#### REFERENCE

"[RFC 6621](#) - Simplified Multicast Forwarding (SMF), Macker, J., May 2012."

DEFVAL { true }

::= { smfConfigurationGroup 13 }

--

-- Table identifying configured multicast addresses to be forwarded.



--

smfConfiguredAddrForwardingTable OBJECT-TYPE

SYNTAX SEQUENCE OF SmfConfiguredAddrForwardingEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"The (conceptual) table containing information on multicast addresses which are to be forwarded by the SMF process.

Entries in this table are configured. As well, addresses to be forwarded by the SMF device can be dynamically discovered by other means. The corresponding state table, smfDiscoveredAddrForwardingTable, contains these additional, dynamically discovered address for forwarding.

Each row is associated with a range of multicast addresses, and ranges for different rows must be disjoint.

The objects in this table are persistent and when written the entity SHOULD save the change to non-volatile storage."

REFERENCE

"[RFC 6621](#) - Simplified Multicast Forwarding (SMF), Macker, J., May 2012."

::= { smfConfigurationGroup 15 }

smfConfiguredAddrForwardingEntry OBJECT-TYPE

SYNTAX SmfConfiguredAddrForwardingEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"An entry (conceptual row) containing the information on a particular multicast scope."

INDEX { smfConfiguredAddrForwardingAddrType,  
smfConfiguredAddrForwardingFirstAddr,  
smfConfiguredAddrForwardingLastAddr }

::= { smfConfiguredAddrForwardingTable 1 }

SmfConfiguredAddrForwardingEntry ::= SEQUENCE {

smfConfiguredAddrForwardingAddrType InetAddressType,

smfConfiguredAddrForwardingFirstAddr InetAddress,

smfConfiguredAddrForwardingLastAddr InetAddress,

smfConfiguredAddrForwardingStatus RowStatus

}

smfConfiguredAddrForwardingAddrType OBJECT-TYPE





SYNTAX        InetAddressType { ipv4(1), ipv6(2) }

MAX-ACCESS not-accessible

STATUS        current

DESCRIPTION

"The type of the addresses in the multicast forwarding range. Legal values correspond to the subset of address families for which multicast address allocation is supported.

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

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

::= { smfConfiguredAddrForwardingEntry 1 }

smfConfiguredAddrForwardingFirstAddr OBJECT-TYPE

SYNTAX        InetAddress (SIZE(4|16))

MAX-ACCESS not-accessible

STATUS        current

DESCRIPTION

"The first address in the multicast scope range. The type of this address is determined by the value of the smfConfiguredAddrForwardingAddrType object.

The value for this object must be less than or equal to the value entered for the smfConfiguredAddrForwardingLastAddr.

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

::= { smfConfiguredAddrForwardingEntry 2 }

smfConfiguredAddrForwardingLastAddr OBJECT-TYPE

SYNTAX        InetAddress (SIZE(4|16))

MAX-ACCESS not-accessible

STATUS        current

DESCRIPTION

"The last address in the multicast scope range. The type of this address is determined by the value of the smfConfiguredAddrForwardingAddrType object.

The value for this object must be greater than or equal to the value entered for the smfConfiguredAddrForwardingFirstAddr.



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

```
::= { smfConfiguredAddrForwardingEntry 3 }
```

smfConfiguredAddrForwardingStatus OBJECT-TYPE

SYNTAX RowStatus

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The status of this row, by which new entries may be created, or old entries deleted from this table."

```
::= { smfConfiguredAddrForwardingEntry 4 }
```

```
--  
-- SMF Interfaces Configuration Table  
--
```

smfInterfaceTable OBJECT-TYPE

SYNTAX SEQUENCE OF SmfInterfaceEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"The SMF Interface Table describes the SMF interfaces that are participating in the SMF packet forwarding process. The ifIndex is from the interfaces group defined in the Interfaces Group MIB ([RFC 2863](#)). As such, this table 'sparse augments' the ifTable specifically when SMF is to be configured to operate over this interface.

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 SMF.

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 and SMF is disabled on this interface, and all configuration and state information related to this interface is to be removed from memory.

If the value of the smfAdminStatus object is changed from 'enabled' to 'disabled', then all rows in this table are to be deleted 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."

::= { smfConfigurationGroup 16 }

#### smfInterfaceEntry OBJECT-TYPE

SYNTAX SmfInterfaceEntry

MAX-ACCESS not-accessible

STATUS current

#### DESCRIPTION

"The SMF interface entry describes one SMF interface as indexed by its ifIndex.

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 smfIfRowStatus object."

INDEX { smfIfIndex }

::= { smfInterfaceTable 1 }

SmfInterfaceEntry ::=

#### SEQUENCE {

smfIfIndex InterfaceIndexOrZero,  
smfIfName DisplayString,  
smfIfAdminStatus SmfStatus,  
smfIfRowStatus RowStatus  
}

#### smfIfIndex OBJECT-TYPE

SYNTAX InterfaceIndexOrZero

MAX-ACCESS not-accessible

STATUS current

#### DESCRIPTION



"The ifIndex for this SMF interface. 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. Kastenholz, June 2000."

::= { smfInterfaceEntry 1 }

## smfIfName OBJECT-TYPE

SYNTAX DisplayString

MAX-ACCESS read-only

STATUS current

## DESCRIPTION

"The textual name of the interface. The value of this object should be the name of the interface as assigned by the local device and should be suitable for use in commands entered at the device's `console'. This might be a text name, such as `le0' or a simple port number, such as `1', depending on the interface naming syntax of the device.

If there is no local name, or this object is otherwise not applicable, then this object contains a zero-length string."

::= { smfInterfaceEntry 2 }

## smfIfAdminStatus OBJECT-TYPE

SYNTAX SmfStatus

MAX-ACCESS read-create

STATUS current

## DESCRIPTION

"The SMF interface's administrative status. The value 'enabled' denotes that the interface is running the SMF forwarding process. The value 'disabled' denotes that the interface is currently external to the SMF forwarding process.

The default value for this object is 'enabled(1)'.

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

DEFVAL { enabled }

::= { smfInterfaceEntry 3 }

## smfIfRowStatus 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 smfIfRowStatus of active(1) is changed, then the updated value MUST be reflected in SMF and this new object value MUST be written to non-volatile storage.

If this object is not equal to active(1), all associated entries in the smfIpv4InterfaceperfTable and the smfIpv6InterfacePerfTable MUST be deleted."

```
::= { smfInterfaceEntry 4 }
```

```
--
```

```
-- smfStateGroup
```

```
--
```

```
-- Contains information describing the current state of the SMF  
-- process such as the current inclusion in the RS or not.
```

```
--
```

```
smfStateGroup OBJECT IDENTIFIER ::= { smfMIBObjects 3 }
```

```
smfNodeRsStatusIncluded OBJECT-TYPE
```

```
SYNTAX      TruthValue
```

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

```
STATUS      current
```

```
DESCRIPTION
```

"The current status of the SMF node in the context of the MANETs relay set. A value of 'true(1)' indicates



that the node is currently part of the MANET Relay Set. A value of 'false(2)' indicates that the node is currently not part of the MANET Relay Set."

## REFERENCE

"[RFC 6621](#) - Simplified Multicast Forwarding (SMF), Macker, J., May 2012."

::= { smfStateGroup 1 }

## smfDpdMemoryOverflow OBJECT-TYPE

SYNTAX Counter32  
UNITS "Overruns"  
MAX-ACCESS read-only  
STATUS current

## DESCRIPTION

"The number of times that the memory for caching records for DPD overran and records had to be flushed. The number of records to be flushed upon a buffer overflow is an implementation specific decision."

## REFERENCE

"[RFC 6621](#) - Simplified Multicast Forwarding (SMF), Macker, J., May 2012."

::= { smfStateGroup 2 }

--

-- Dynamically Discovered Multicast Addr Table

--

## smfDiscoveredAddrForwardingTable OBJECT-TYPE

SYNTAX SEQUENCE OF SmfDiscoveredAddrForwardingEntry  
MAX-ACCESS not-accessible  
STATUS current

## DESCRIPTION

"This state table, smfDiscoveredAddrForwardingTable, contains additional, dynamically discovered addresses for forwarding.

Each row is associated with a range of multicast addresses, and ranges for different rows must be disjoint."

## REFERENCE

"[RFC 6621](#) - Simplified Multicast Forwarding (SMF), Macker, J., May 2012."

::= { smfStateGroup 3 }

## smfDiscoveredAddrForwardingEntry OBJECT-TYPE

SYNTAX SmfDiscoveredAddrForwardingEntry



```
MAX-ACCESS not-accessible
STATUS      current
DESCRIPTION
    "An entry (conceptual row) containing the information on a
    particular multicast scope."
INDEX { smfDiscoveredAddrForwardingAddrType,
        smfDiscoveredAddrForwardingFirstAddr,
        smfDiscoveredAddrForwardingLastAddr }
 ::= { smfDiscoveredAddrForwardingTable 1 }

SmfDiscoveredAddrForwardingEntry ::= SEQUENCE {
    smfDiscoveredAddrForwardingAddrType  InetAddressType,
    smfDiscoveredAddrForwardingFirstAddr  InetAddress,
    smfDiscoveredAddrForwardingLastAddr   InetAddress,
    smfDiscoveredAddrForwardingSource     SnmpAdminString
}

smfDiscoveredAddrForwardingAddrType OBJECT-TYPE
    SYNTAX      InetAddressType { ipv4(1), ipv6(2) }
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The type of the addresses in the multicast forwarding
        range.  Legal values correspond to the subset of
        address families for which multicast address allocation
        is supported.

        Only the values ipv4(1) and
        ipv6(2) are supported."
    ::= { smfDiscoveredAddrForwardingEntry 1 }

smfDiscoveredAddrForwardingFirstAddr OBJECT-TYPE
    SYNTAX      InetAddress (SIZE(4|16))
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The first address in the multicast scope range.  The type
        of this address is determined by the value of the
        smfConfiguredAddrForwardingAddrType object.

        The value for this object must be less than or
        equal to the value entered for the
        smfDiscoveredAddrForwardingLastAddr."
    ::= { smfDiscoveredAddrForwardingEntry 2 }

smfDiscoveredAddrForwardingLastAddr OBJECT-TYPE
    SYNTAX      InetAddress (SIZE(4|16))
    MAX-ACCESS  not-accessible
```



```
STATUS      current
DESCRIPTION
    "The last address in the multicast scope range.
    The type of this address is determined by the
    value of the smfConfiguredAddrForwardingAddrType
    object.

    The value for this object must be greater than or
    equal to the value entered for the
    smfDiscoveredAddrForwardingFirstAddr."
::= { smfDiscoveredAddrForwardingEntry 3 }

smfDiscoveredAddrForwardingSource OBJECT-TYPE
    SYNTAX      SnmpAdminString
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The textual description of the method by which
        this multicast address range was discovered."
    ::= { smfDiscoveredAddrForwardingEntry 4 }

--
-- SMF Neighbor Table
--

smfNeighborTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF SmfNeighborEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The SMF NeighborTable describes the
        current one-hop neighbor nodes, their address
        and SMF RSSA and the interface on which
        they can be reached."
    REFERENCE
        "RFC 6621 - Simplified Multicast Forwarding
        (SMF), Macker, J., May 2012.
        Section 7: SMF Neighborhood Discovery
        Requirements."
    ::= { smfStateGroup 4 }

smfNeighborEntry OBJECT-TYPE
    SYNTAX      SmfNeighborEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
```





```
"The SMF Neighbor Table contains the
  set of one-hop neighbors, the interface
  they are reachable on and the SMF RSSA
  they are currently running."
INDEX { smfNeighborIpAddrType,
        smfNeighborIpAddr,
        smfNeighborPrefixLen }
 ::= { smfNeighborTable 1 }

SmfNeighborEntry ::=
  SEQUENCE {
    smfNeighborIpAddrType      InetAddressType,
    smfNeighborIpAddr          InetAddress,
    smfNeighborPrefixLen       InetAddressPrefixLength,
    smfNeighborRSSA            SmfRssaID,
    smfNeighborNextHopInterface InterfaceIndexOrZero
  }

smfNeighborIpAddrType OBJECT-TYPE
  SYNTAX      InetAddressType { ipv4(1), ipv6(2) }
  MAX-ACCESS  not-accessible
  STATUS      current
  DESCRIPTION
    "The one-hop neighbor IP address type.

    Only the values 'ipv4(1)' and
    'ipv6(2)' are supported."
 ::= { smfNeighborEntry 1 }

smfNeighborIpAddr OBJECT-TYPE
  SYNTAX      InetAddress (SIZE(4|16))
  MAX-ACCESS  not-accessible
  STATUS      current
  DESCRIPTION
    "The one-hop neighbor Inet IPv4 or IPv6
    address.

    Only IPv4 and IPv6 addresses
    are supported."
 ::= { smfNeighborEntry 2 }

smfNeighborPrefixLen OBJECT-TYPE
  SYNTAX      InetAddressPrefixLength
  UNITS       "bits"
  MAX-ACCESS  not-accessible
  STATUS      current
  DESCRIPTION
    "The prefix length. This is a decimal value that
```



```
        indicates the number of contiguous, higher-order
        bits of the address that make up the network
        portion of the address."
 ::= { smfNeighborEntry 3 }

smfNeighborRSSA OBJECT-TYPE
    SYNTAX      SmfRssaID
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The current RSSA running on the neighbor.
        The list is identical to that described
        above for the smfRssa object."
 ::= { smfNeighborEntry 4 }

smfNeighborNextHopInterface OBJECT-TYPE
    SYNTAX      InterfaceIndexOrZero
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The interface ifIndex over which the
        neighbor is reachable in one-hop."
 ::= { smfNeighborEntry 5 }

--
-- SMF Performance Group
--
-- Contains objects which help to characterize the
-- performance of the SMF RSSA process, such as statistics
-- counters. There are two types of SMF RSSA statistics:
-- global counters and per interface counters.
--

smfPerformanceGroup OBJECT IDENTIFIER ::= { smfMIBObjects 4 }

smfGlobalPerfGroup OBJECT IDENTIFIER ::= { smfPerformanceGroup 1 }

--
-- IPv4 packet counters
--

smfIpv4MultiPktsRecvTotal OBJECT-TYPE
    SYNTAX      Counter32
    UNITS       "Packets"
    MAX-ACCESS  read-only
```



STATUS current

DESCRIPTION

"A counter of the total number of  
multicast IPv4 packets received by the  
device and delivered to the SMF process."

REFERENCE

"[RFC 6621](#) - Simplified Multicast Forwarding  
(SMF), Macker, J., May 2012."

::= { smfGlobalPerfGroup 1 }

smfIpv4MultiPktsForwardedTotal OBJECT-TYPE

SYNTAX Counter32

UNITS "Packets"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"A counter of the total number of  
multicast IPv4 packets forwarded by the  
device."

REFERENCE

"[RFC 6621](#) - Simplified Multicast Forwarding  
(SMF), Macker, J., May 2012."

::= { smfGlobalPerfGroup 2 }

smfIpv4DuplMultiPktsDetectedTotal OBJECT-TYPE

SYNTAX Counter32

UNITS "Packets"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"A counter of the total number of duplicate  
multicast IPv4 packets detected by the  
device."

REFERENCE

"[RFC 6621](#) - Simplified Multicast Forwarding  
(SMF), Macker, J., May 2012."

::= { smfGlobalPerfGroup 3 }

smfIpv4DroppedMultiPktsTTLExceededTotal OBJECT-TYPE

SYNTAX Counter32

UNITS "Packets"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"A counter of the total number of dropped  
multicast IPv4 packets by the  
device due to TTL exceeded."

REFERENCE



```
    "RFC 6621 - Simplified Multicast Forwarding
      (SMF), Macker, J., May 2012."
 ::= { smfGlobalPerfGroup 4 }

smfIpv4TTLLargerThanPreviousTotal  OBJECT-TYPE
    SYNTAX      Counter32
    UNITS        "Packets"
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
        "A counter of the total number of IPv4 packets
         recieved which have a TTL larger than that
         of a previously received identical packet."
    REFERENCE
        "RFC 6621 - Simplified Multicast Forwarding
         (SMF), Macker, J., May 2012."
 ::= { smfGlobalPerfGroup 5 }

--
-- IPv6 packet counters
--

smfIpv6MultiPktsRecvTotal  OBJECT-TYPE
    SYNTAX      Counter32
    UNITS        "Packets"
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
        "A counter of the total number of
         multicast IPv6 packets received by the
         device and delivered to the SMF process."
    REFERENCE
        "RFC 6621 - Simplified Multicast Forwarding
         (SMF), Macker, J., May 2012."
 ::= { smfGlobalPerfGroup 6 }

smfIpv6MultiPktsForwardedTotal  OBJECT-TYPE
    SYNTAX      Counter32
    UNITS        "Packets"
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
        "A counter of the total number of
         multicast IPv6 packets forwarded by the
         device."
    REFERENCE
        "RFC 6621 - Simplified Multicast Forwarding
         (SMF), Macker, J., May 2012."
```





```
::= { smfGlobalPerfGroup 7 }
```

```
smfIpv6DuplMultiPktsDetectedTotal  OBJECT-TYPE
```

```
    SYNTAX      Counter32
```

```
    UNITS       "Packets"
```

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

```
    STATUS      current
```

```
    DESCRIPTION
```

```
        "A counter of the total number of duplicate  
        multicast IPv6 packets detected by the  
        device."
```

```
    REFERENCE
```

```
        "RFC 6621 - Simplified Multicast Forwarding  
        (SMF), Macker, J., May 2012."
```

```
::= { smfGlobalPerfGroup 8 }
```

```
smfIpv6DroppedMultiPktsTTLExceededTotal  OBJECT-TYPE
```

```
    SYNTAX      Counter32
```

```
    UNITS       "Packets"
```

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

```
    STATUS      current
```

```
    DESCRIPTION
```

```
        "A counter of the total number of dropped  
        multicast IPv6 packets by the  
        device due to TTL exceeded."
```

```
    REFERENCE
```

```
        "RFC 6621 - Simplified Multicast Forwarding  
        (SMF), Macker, J., May 2012."
```

```
::= { smfGlobalPerfGroup 9 }
```

```
smfIpv6TTLLargerThanPreviousTotal  OBJECT-TYPE
```

```
    SYNTAX      Counter32
```

```
    UNITS       "Packets"
```

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

```
    STATUS      current
```

```
    DESCRIPTION
```

```
        "A counter of the total number of IPv6 packets  
        recieved which have a TTL larger than that  
        of a previously recieved identical packet."
```

```
    REFERENCE
```

```
        "RFC 6621 - Simplified Multicast Forwarding  
        (SMF), Macker, J., May 2012."
```

```
::= { smfGlobalPerfGroup 10 }
```

```
smfIpv6HAVAssistsReqdTotal  OBJECT-TYPE
```

```
    SYNTAX      Counter32
```

```
    UNITS       "Packets"
```

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



```
STATUS      current
DESCRIPTION
    "A counter of the total number of IPv6 packets
    received which required the HAV assist for DPD."
REFERENCE
    "RFC 6621 - Simplified Multicast Forwarding
    (SMF), Macker, J., May 2012."
::= { smfGlobalPerfGroup 11 }

smfIpv6DpdHeaderInsertionsTotal OBJECT-TYPE
    SYNTAX      Counter32
    UNITS        "Packets"
    MAX-ACCESS   read-only
    STATUS      current
    DESCRIPTION
        "A counter of the total number of IPv6 packets
        recieved which the device inserted the
        DPD header option."
    REFERENCE
        "RFC 6621 - Simplified Multicast Forwarding
        (SMF), Macker, J., May 2012."
    ::= { smfGlobalPerfGroup 12 }

--
-- Per SMF Interface Performance Table
--

smfInterfacePerfGroup OBJECT IDENTIFIER ::= { smfPerformanceGroup 2 }

smfIpv4InterfacePerfTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF SmfIpv4InterfacePerfEntry
    MAX-ACCESS   not-accessible
    STATUS      current
    DESCRIPTION
        "The SMF Interface Performance Table
        describes the SMF counters per
        interface."
    REFERENCE
        "RFC 6621 - Simplified Multicast Forwarding
        (SMF), Macker, J., May 2012."
    ::= { smfInterfacePerfGroup 1 }

smfIpv4InterfacePerfEntry OBJECT-TYPE
    SYNTAX      SmfIpv4InterfacePerfEntry
    MAX-ACCESS   not-accessible
    STATUS      current
    DESCRIPTION
```



```
"The SMF Interface Performance entry
describes the statistics for a particular
node interface."
INDEX { smfIfIndex }
 ::= { smfIpv4InterfacePerfTable 1 }

SmfIpv4InterfacePerfEntry ::=
  SEQUENCE {
    smfIpv4MultiPktsRecvPerIf          Counter32,
    smfIpv4MultiPktsForwardedPerIf     Counter32,
    smfIpv4DuplMultiPktsDetectedPerIf  Counter32,
    smfIpv4DroppedMultiPktsTTLExceededPerIf Counter32,
    smfIpv4TTLLargerThanPreviousPerIf  Counter32
  }

smfIpv4MultiPktsRecvPerIf  OBJECT-TYPE
  SYNTAX      Counter32
  UNITS       "Packets"
  MAX-ACCESS  read-only
  STATUS      current
  DESCRIPTION
    "A counter of the number of
    multicast IP packets received by the
    SMF process on this device on
    this interface."
  ::= { smfIpv4InterfacePerfEntry 1 }

smfIpv4MultiPktsForwardedPerIf  OBJECT-TYPE
  SYNTAX      Counter32
  UNITS       "Packets"
  MAX-ACCESS  read-only
  STATUS      current
  DESCRIPTION
    "A counter of the number of
    multicast IP packets forwarded by the
    SMF process on this device
    on this interface."
  ::= { smfIpv4InterfacePerfEntry 2 }

smfIpv4DuplMultiPktsDetectedPerIf  OBJECT-TYPE
  SYNTAX      Counter32
  UNITS       "Packets"
  MAX-ACCESS  read-only
  STATUS      current
  DESCRIPTION
    "A counter of the number of duplicate
    multicast IP packets detected by the
    SMF process on this device"
```



```
        on this interface."
 ::= { smfIpv4InterfacePerfEntry 3 }

smfIpv4DroppedMultiPktsTTLExceededPerIf  OBJECT-TYPE
    SYNTAX      Counter32
    UNITS        "Packets"
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
        "A counter of the total number of dropped
        multicast IPv4 packets by the SMF process
        on this device on this interface
        due to TTL exceeded."
 ::= { smfIpv4InterfacePerfEntry 4 }

smfIpv4TTLLargerThanPreviousPerIf  OBJECT-TYPE
    SYNTAX      Counter32
    UNITS        "Packets"
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
        "A counter of the total number of IPv4 packets
        received by the SMF process on this device
        on this interface which have a TTL larger than
        that of a previously recived identical packet."
 ::= { smfIpv4InterfacePerfEntry 5 }

smfIpv6InterfacePerfTable  OBJECT-TYPE
    SYNTAX      SEQUENCE OF SmfIpv6InterfacePerfEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
        "The SMF Interface Performance Table
        describes the SMF counters per
        interface."
    REFERENCE
        "RFC 6621 - Simplified Multicast Forwarding
        (SMF), Macker, J., May 2012."
 ::= { smfInterfacePerfGroup 2 }

smfIpv6InterfacePerfEntry  OBJECT-TYPE
    SYNTAX      SmfIpv6InterfacePerfEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
        "The SMF Interface Performance entry
        describes the counters for a particular
```





```
node interface."
INDEX { smfIfIndex }
 ::= { smfIpv6InterfacePerfTable 1 }

SmfIpv6InterfacePerfEntry ::=
  SEQUENCE {
    smfIpv6MultiPktsRecvPerIf          Counter32,
    smfIpv6MultiPktsForwardedPerIf     Counter32,
    smfIpv6DuplMultiPktsDetectedPerIf  Counter32,
    smfIpv6DroppedMultiPktsTTLExceededPerIf Counter32,
    smfIpv6TTLargerThanPreviousPerIf   Counter32,
    smfIpv6HAVAssistsReqdPerIf         Counter32,
    smfIpv6DpdHeaderInsertionsPerIf    Counter32
  }

smfIpv6MultiPktsRecvPerIf  OBJECT-TYPE
  SYNTAX      Counter32
  UNITS       "Packets"
  MAX-ACCESS  read-only
  STATUS      current
  DESCRIPTION
    "A counter of the number of
     multicast IP packets received by the
     SMF process on this device
     on this interface."
 ::= { smfIpv6InterfacePerfEntry 1 }

smfIpv6MultiPktsForwardedPerIf  OBJECT-TYPE
  SYNTAX      Counter32
  UNITS       "Packets"
  MAX-ACCESS  read-only
  STATUS      current
  DESCRIPTION
    "A counter of the number of
     multicast IP packets forwarded by the
     SMF process on this device
     on this interface."
 ::= { smfIpv6InterfacePerfEntry 2 }

smfIpv6DuplMultiPktsDetectedPerIf  OBJECT-TYPE
  SYNTAX      Counter32
  UNITS       "Packets"
  MAX-ACCESS  read-only
  STATUS      current
  DESCRIPTION
    "A counter of the number of duplicate
     multicast IP packets detected by the
     SMF process on this device"
```



```
        on this interface."
 ::= { smfIpv6InterfacePerfEntry 3 }

smfIpv6DroppedMultiPktsTTLExceededPerIf  OBJECT-TYPE
    SYNTAX      Counter32
    UNITS        "Packets"
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
        "A counter of the number of dropped
        multicast IP packets by the
        SMF process on this device
        on this interface due to TTL
        exceeded."
 ::= { smfIpv6InterfacePerfEntry 4 }

smfIpv6TTLLargerThanPreviousPerIf  OBJECT-TYPE
    SYNTAX      Counter32
    UNITS        "Packets"
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
        "A counter of the total number of IPv6 packets
        received which have a TTL larger than that
        of a previously received identical packet
        by the SMF process on this device on this
        interface."
 ::= { smfIpv6InterfacePerfEntry 5 }

smfIpv6HAVAssistsReqdPerIf  OBJECT-TYPE
    SYNTAX      Counter32
    UNITS        "Packets"
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
        "A counter of the total number of IPv6 packets
        received by the SMF process on this device
        on this interface which required the
        HAV assist for DPD."
 ::= { smfIpv6InterfacePerfEntry 6 }

smfIpv6DpdHeaderInsertionsPerIf  OBJECT-TYPE
    SYNTAX      Counter32
    UNITS        "Packets"
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
        "A counter of the total number of IPv6 packets
```



```
        received by the SMF process on this device
        on this interface which the device inserted the
        DPD header option."
 ::= { smfIpv6InterfacePerfEntry 7 }
```

```
--
-- Notifications
--
```

```
smfMIBNotifObjects OBJECT IDENTIFIER ::= { smfMIBNotifications 0 }
smfMIBNotifControl OBJECT IDENTIFIER ::= { smfMIBNotifications 1 }
```

```
-- smfMIBNotifObjects
```

```
smfAdminStatusChange NOTIFICATION-TYPE
```

```
    OBJECTS { smfRouterIDAddrType, -- The originator of
-- the notification.
              smfRouterID,         -- The originator of
-- the notification.
              smfAdminStatus       -- The new status of the
-- SMF process.
    }
    STATUS      current
    DESCRIPTION
```

```
    "smfAdminStatusChange is a notification sent when a
    the 'smfAdminStatus' object changes."
    ::= { smfMIBNotifObjects 1 }
```

```
smfConfiguredOpModeChange NOTIFICATION-TYPE
```

```
    OBJECTS { smfRouterIDAddrType, -- The originator of
-- the notification.
              smfRouterID,         -- The originator of
-- the notification.
              smfConfiguredOpMode -- The new Operations
-- Mode of the SMF
-- process.
    }
    STATUS      current
    DESCRIPTION
```

```
    "smfConfiguredOpModeChange is a notification
    sent when a the 'smfConfiguredOpMode' object
    changes."
    ::= { smfMIBNotifObjects 2 }
```

```
smfConfiguredRssaChange NOTIFICATION-TYPE
```



```
OBJECTS { smfRouterIDAddrType, -- The originator of
          -- the notification.
          smfRouterID,          -- The originator of
          -- the notification.
          smfConfiguredRssa     -- The new RSSA for
          -- the SMF process.
        }
STATUS      current
DESCRIPTION
    "smfAdminStatusChange is a notification sent when a
    the 'smfConfiguredRssa' object changes."
 ::= { smfMIBNotifObjects 3 }

smfIfAdminStatusChange NOTIFICATION-TYPE
OBJECTS { smfRouterIDAddrType, -- The originator of
          -- the notification.
          smfRouterID,          -- The originator of
          -- the notification.
          smfIfName,            -- The interface whose
          -- status has changed.
          smfIfAdminStatus      -- The new status of the
          -- SMF interface.
        }
STATUS      current
DESCRIPTION
    "smfIfAdminStatusChange is a notification sent when a
    the 'smfIfAdminStatus' object changes."
 ::= { smfMIBNotifObjects 4 }

smfDpdMemoryOverflowEvent NOTIFICATION-TYPE
OBJECTS { smfRouterIDAddrType, -- The originator of
          -- the notification.
          smfRouterID,          -- The originator of
          -- the notification.
          smfDpdMemoryOverflow -- The counter of
          -- the overflows.
        }
STATUS      current
DESCRIPTION
    "smfDpdMemoryOverflowEvents is sent when the
    number of memory overflow events exceeds the
    the 'smfDpdMemoryOverflowThreshold' within the
    previous number of seconds defined by the
    'smfDpdMemoryOverflowWindow'."
 ::= { smfMIBNotifObjects 5 }
```





```
-- smfMIBNotifControl
smfDpdMemoryOverflowThreshold OBJECT-TYPE
    SYNTAX      Integer32 (0..255)
    UNITS        "Events"
    MAX-ACCESS   read-write
    STATUS       current
    DESCRIPTION
        "A threshold value for the
        `smfDpdMemoryOverflowEvents' object.
        If the number of occurrences exceeds
        this threshold within the previous
        number of seconds
        'smfDpdMemoryOverflowWindow',
        then the `smfDpdMemoryOverflowEvent'
        notification is sent.

        The default value for this object is
        '1'."
    DEFVAL { 1 }
    ::= { smfMIBNotifControl 1 }

smfDpdMemoryOverflowWindow OBJECT-TYPE
    SYNTAX      TimeTicks
    MAX-ACCESS   read-write
    STATUS       current
    DESCRIPTION
        "A time window value for the
        `smfDpdMemoryOverflowEvents' object.
        If the number of occurrences exceeds
        the `smfDpdMemoryOverflowThreshold'
        within the previous number of seconds
        'smfDpdMemoryOverflowWindow',
        then the `smfDpdMemoryOverflowEvent'
        notification is sent.

        The default value for this object is
        '1'."
    DEFVAL { 1 }
    ::= { smfMIBNotifControl 2 }

--
-- Compliance Statements
--

smfCompliances OBJECT IDENTIFIER ::= { smfMIBConformance 1 }
smfMIBGroups   OBJECT IDENTIFIER ::= { smfMIBConformance 2 }
```



```
smfBasicCompliance  MODULE-COMPLIANCE
    STATUS current
    DESCRIPTION "The basic implementation requirements for
                 managed network entities that implement
                 the SMF RSSA process."
    MODULE -- this module
    MANDATORY-GROUPS { smfCapabObjectsGroup,
                       smfConfigObjectsGroup }
 ::= { smfCompliances 1 }
```

```
smfFullCompliance  MODULE-COMPLIANCE
    STATUS current
    DESCRIPTION "The full implementation requirements for
                 managed network entities that implement
                 the SMF RSSA process."
    MODULE -- this module
    MANDATORY-GROUPS { smfCapabObjectsGroup,
                       smfConfigObjectsGroup,
                       smfStateObjectsGroup,
                       smfPerfObjectsGroup,
                       smfNotifObjectsGroup,
                       smfNotificationsGroup
                       }
 ::= { smfCompliances 2 }
```

```
--
-- Units of Conformance
--
```

```
smfCapabObjectsGroup  OBJECT-GROUP
    OBJECTS {
        smfOpModeCapabilitiesName,
        smfOpModeCapabilitiesReference,

        smfRssaCapabilitiesName,
        smfRssaCapabilitiesReference
    }
    STATUS current
    DESCRIPTION
        "Set of SMF configuration objects implemented
        in this module."
 ::= { smfMIBGroups 1 }
```

```
smfConfigObjectsGroup  OBJECT-GROUP
    OBJECTS {
        smfAdminStatus,
        smfRouterIDAddrType,
        smfRouterID,
```



```
        smfIfName,
        smfConfiguredOpMode,
        smfConfiguredRssa,
        smfRssaMember,
        smfIpv4Dpd,
        smfIpv6Dpd,
        smfMaxPktLifetime,
        smfDpdMaxMemorySize,
        smfDpdEntryMaxLifetime,
        smfNhdpRssaMesgTLVIncluded,
        smfNhdpRssaAddrBlockTLVIncluded,

        smfConfiguredAddrForwardingStatus,

        smfIfAdminStatus,
        smfIfRowStatus
    }
    STATUS current
    DESCRIPTION
        "Set of SMF configuration objects implemented
        in this module."
    ::= { smfMIBGroups 2 }

smfStateObjectsGroup OBJECT-GROUP
    OBJECTS {
        smfNodeRsStatusIncluded,
        smfDpdMemoryOverflow,

        smfDiscoveredAddrForwardingSource,

        smfNeighborRSSA,
        smfNeighborNextHopInterface
    }
    STATUS current
    DESCRIPTION
        "Set of SMF state objects implemented
        in this module."
    ::= { smfMIBGroups 3 }

smfPerfObjectsGroup OBJECT-GROUP
    OBJECTS {
        smfIpv4MultiPktsRecvTotal,
        smfIpv4MultiPktsForwardedTotal,
        smfIpv4DuplMultiPktsDetectedTotal,
        smfIpv4DroppedMultiPktsTTLExceededTotal,
        smfIpv4TTLLargerThanPreviousTotal,

        smfIpv6MultiPktsRecvTotal,
```



```
    smfIpv6MultiPktsForwardedTotal,
    smfIpv6DuplMultiPktsDetectedTotal,
    smfIpv6DroppedMultiPktsTTLExceededTotal,
    smfIpv6TTLLargerThanPreviousTotal,
    smfIpv6HAVAssistsReqdTotal,
    smfIpv6DpdHeaderInsertionsTotal,

    smfIpv4MultiPktsRecvPerIf,
    smfIpv4MultiPktsForwardedPerIf,
    smfIpv4DuplMultiPktsDetectedPerIf,
    smfIpv4DroppedMultiPktsTTLExceededPerIf,
    smfIpv4TTLLargerThanPreviousPerIf,

    smfIpv6MultiPktsRecvPerIf,
    smfIpv6MultiPktsForwardedPerIf,
    smfIpv6DuplMultiPktsDetectedPerIf,
    smfIpv6DroppedMultiPktsTTLExceededPerIf,
    smfIpv6TTLLargerThanPreviousPerIf,
    smfIpv6HAVAssistsReqdPerIf,
    smfIpv6DpdHeaderInsertionsPerIf
}
STATUS current
DESCRIPTION
    "Set of SMF performance objects implemented
    in this module by total and per interface."
::= { smfMIBGroups 4 }

smfNotifObjectsGroup OBJECT-GROUP
    OBJECTS {
        smfDpdMemoryOverflowThreshold,
        smfDpdMemoryOverflowWindow
    }
    STATUS current
    DESCRIPTION
        "Set of SMF notification control
        objects implemented in this module."
    ::= { smfMIBGroups 5 }

smfNotificationsGroup NOTIFICATION-GROUP
    NOTIFICATIONS {
        smfAdminStatusChange,
        smfConfiguredOpModeChange,
        smfConfiguredRssaChange,
        smfIfAdminStatusChange,
        smfDpdMemoryOverflowEvent
    }
    STATUS current
    DESCRIPTION
```





```
"Set of SMF notifications implemented
  in this module."
 ::= { smfMIBGroups 6 }
```

END

## **8. Security Considerations**

This section discusses security implications of the choices made in this SMF-MIB module.

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 'smfAdminStatus' - this writable configuration object controls the operational status of the SMF process. If this setting is configured inconsistently across the MANET multicast domain, then delivery of multicast data may be inconsistent across the domain; some nodes may not receive multicast data intended for them.
- o 'smfRouterIDAddrType' and 'smfRouterID' - these writable configuration objects define the ID of the SMF process. These objects should be configured with a routable address defined on the local SMF device. The smfRouterID is a logical identification that MUST be configured as unique across inter-operating SMF neighborhoods and it is RECOMMENDED to be chosen as the numerically largest address contained in a node's 'Neighbor Address List' as defined in NHDP. A smfRouterID MUST be unique within the scope of the operating MANET network regardless of the method used for selecting it.
- o 'smfConfiguredOpMode' - this writable configuration objects define the operational mode of the SMF process. The operational mode defines how the SMF process develops its local estimate of the CDS.
- o 'smfConfiguredRssa' - this writable configuration object sets the specific Reduced Set Selection Algorithm (RSSA) for the SMF process. If this object is set inconsistently across the MANET domain, multicast delivery of data will fail.



- o 'smfRssaMember' - this writable configuration object sets the 'interest' of the local SMF node in participating in the CDS. Setting this object to 'never(3)' on a highly highly connected device could lead to frequent island formation. Setting this object to 'always(2)' could support data ex-filtration from the MANET domain.
- o 'smfIpv4Dpd' - this writable configuration object sets the duplicate packet detection method for forwarding of IPv4 multicast packets.
- o 'smfIpv6Dpd' - this writable configuration object sets the duplicate packet detection method for forwarding of IPv6 multicast packets.
- o 'smfMaxPktLifetime' - this writable configuration object sets the estimate of the network packet traversal time. If set too small, this could lead to poor multicast data delivery ratios throughout the MANET domain.
- o 'smfDpdMaxMemorySize' - this writable configuration object sets the memory storage size (in Kilo-Bytes) for the cached DPD records for the combined IPv4 and IPv6 methods. If set too small this could lead to poor performance of the duplicate packet protection algorithms and lead to inefficient resource, e.g., link, utilization within the MANET domain. The local SMF device should protect itself against memory overruns in the event that too large a setting is requested.
- o 'smfDpdEntryMaxLifetime' - this writable configuration object sets the maximum lifetime (in seconds) for the cached DPD records for the combined IPv4 and IPv6 methods. If the memory is running low prior to the MaxLifetimes being exceeded, the local SMF devices should purge the oldest records first.
- o 'smfNhdpRssaMesgTLVIncluded' - this writable configuration object indicates whether the associated NHDP messages include the the RSSA Message TLV, or not. It is highly RECOMMENDED that this object be set to 'true(1)'.
- o 'smfNhdpRssaAddrBlockTLVIncluded' - this writable configuration object indicates whether the associated NHDP messages include the the RSSA Address Block TLV, or not. The smfNhdpRssaAddrBlockTLVIncluded is optional in all cases as it depends on the existence of an address block which may not be present. If this SMF device is configured with NHDP, then this object should be set to 'true(1)'.



- o 'smfConfiguredAddrForwardingTable' - the writable configuration objects in this table indicate which multicast IP address are to be forwarded by this SMF node. Misconfiguration of rows within this table can limit the ability of this SMF device to forward multicast data.
- o 'smfInterfaceTable' - the writable configuration objects in this table indicate which SMF node interfaces are participating in the SMF packet forwarding process. Misconfiguration of rows within this table can limit the ability of this SMF device to forward multicast data.

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 'smfNodeRsStatusIncluded' - this readable state object indicates that this SMF node is part of the CDS, or not. Being part of the CDS makes this node a distinguished device. It could be exploited for data ex-filtration, or denial of service attacks.
- o 'smfDiscoveredAddrForwardingTable' - the readable state objects in this table indicate which, dynamically discovered, multicast IP address are to be forwarded by this SMF node.
- o 'smfNeighborTable' - the readable state objects in this table indicate current neighbor nodes to this SMF node. Exposing this information to an attacker could allow the attacker easier access to the larger MANET domain.

The remainder of the objects in the SMF-MIB are performance counter objects. While these give an indication of the activity of the SMF process on this node, it is not expected that exposing these values pose a security risk to the MANET network.

SNMP versions prior to SNMPv3 did not include adequate security. Even if the network itself is secure (for example by using IPSec), even then, there is no control as to who on the secure network is allowed to access and GET/SET (read/change/create/delete) the objects in this MIB module.

Implementations MUST 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. Applicability Statement

This document describes objects for configuring parameters of the Simplified Multicast Forwarding [[RFC6621](#)] process on a Mobile Ad-Hoc Network (MANET) router. This MIB module, denoted SMF-MIB, also reports state and performance information and notifications. This section provides some examples of how this MIB module can be used in MANET network deployments. A fuller discussion of MANET network management use cases and challenges will be provided elsewhere.

SMF is designed to allow MANET routers to forward IPv4 and IPv6 packets over the MANET and cover the MANET nodes through the automatic discovery of efficient estimates of the Minimum Connected Dominating Set (MCDS) of nodes within the MANET. The MCDS are estimated using the Relay Set Selection Algorithms (RSSAs) discussed within this document. In the following, three scenarios are listed where this MIB module is useful, i.e.,

- o For a Parking Lot Initial Configuration Situation - it is common for the vehicles comprising the MANET being forward deployed at a remote location, e.g., the site of a natural disaster, to be off-loaded in a parking lot where an initial configuration of the networking devices is performed. The configuration is loaded into the devices from a fixed location Network Operation Center (NOC) at the parking lot and the vehicles are stationary at the parking lot while the configuration changes are made. Standards-based methods for configuration management from the co-located NOC are necessary for this deployment option. The set of interesting configuration objects for the SMF process are listed within this MIB module.
- o For Mobile vehicles with Low Bandwidth Satellite Link to a Fixed NOC - Here the vehicles carrying the MANET routers carry multiple wireless interfaces, one of which is a relatively low-bandwidth on-the-move satellite connection which interconnects a fix NOC to





the nodes of the MANET. Standards-based methods for monitoring and fault management from the fixed NOC are necessary for this deployment option.

- o For Fixed NOC and Mobile Local Manager in Larger Vehicles - for larger vehicles, a hierarchical network management arrangement is useful. Centralized network management is performed from a fixed NOC while local management is performed locally from within the vehicles. Standards-based methods for configuration, monitoring and fault management are necessary for this deployment option.

## **10. 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
-----	-----
SMF-MIB	{ experimental XXXX }
IANA EDITOR NOTE: please assign XXXX, and remove this note.	

## **11. Contributors**

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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#### Appendix A.

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