

Internet Engineering Task Force
Internet-Draft
Intended status: Experimental
Expires: April 4, 2012

R. Cole
US Army CERDEC
J. Macker
B. Adamson
Naval Research Laboratory
S. Harnedy
Booz Allen Hamilton
October 2, 2011

**Definition of Managed Objects for the Manet Simplified Multicast
Framework Relay Set Process
draft-ietf-manet-smf-mib-03**

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.

Status of This Memo

This Internet-Draft is submitted in full conformance with the provisions of [BCP 78](#) and [BCP 79](#).

Internet-Drafts are working documents of the Internet Engineering Task Force (IETF). Note that other groups may also distribute working documents as Internet-Drafts. The list of current Internet-Drafts is at <http://datatracker.ietf.org/drafts/current/>.

Internet-Drafts are draft documents valid for a maximum of six months and may be updated, replaced, or obsoleted by other documents at any time. It is inappropriate to use Internet-Drafts as reference material or to cite them other than as "work in progress."

This Internet-Draft will expire on April 4, 2012.

Copyright Notice

Copyright (c) 2011 IETF Trust and the persons identified as the document authors. All rights reserved.

This document is subject to [BCP 78](#) and the IETF Trust's Legal

Provisions Relating to IETF Documents
[\(<http://trustee.ietf.org/license-info>\)](http://trustee.ietf.org/license-info) in effect on the date of publication of this document. Please review these documents carefully, as they describe your rights and restrictions with respect to this document. Code Components extracted from this document must include Simplified BSD License text as described in Section 4.e of the Trust Legal Provisions and are provided without warranty as described in the Simplified BSD License.

Table of Contents

- [1.](#) Introduction [3](#)
- [2.](#) The Internet-Standard Management Framework [3](#)
- [3.](#) Conventions [3](#)
- [4.](#) Overview [3](#)
 - [4.1.](#) SMF Management Model [4](#)
 - [4.2.](#) Terms [5](#)
- [5.](#) Structure of the MIB Module [5](#)
 - [5.1.](#) Textual Conventions [6](#)
 - [5.2.](#) The Capabilities Group [6](#)
 - [5.3.](#) The Configuration Group [7](#)
 - [5.4.](#) The State Group [7](#)
 - [5.5.](#) The Performance Group [7](#)
 - [5.6.](#) The Notifications Group [8](#)
- [6.](#) Relationship to Other MIB Modules [8](#)
 - [6.1.](#) Relationship to the SNMPv2-MIB [8](#)
 - [6.2.](#) MIB modules required for IMPORTS [8](#)
 - [6.3.](#) Relationship to the Future RSSA-MIBs [8](#)
- [7.](#) Definitions [9](#)
- [8.](#) Security Considerations [48](#)
- [9.](#) IANA Considerations [51](#)
- [10.](#) Contributors [52](#)
- [11.](#) References [52](#)
 - [11.1.](#) Normative References [52](#)
 - [11.2.](#) Informative References [53](#)
- [Appendix A.](#) Change Log [53](#)
- [Appendix B.](#) Open Issues [54](#)
- [Appendix C.](#) [54](#)

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) [[I-D.ietf-manet-smf](#)] 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 metrics, 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 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 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 [[I-D.ietf-manet-smf](#)] 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 [[I-D.ietf-manet-smf](#)]) 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.

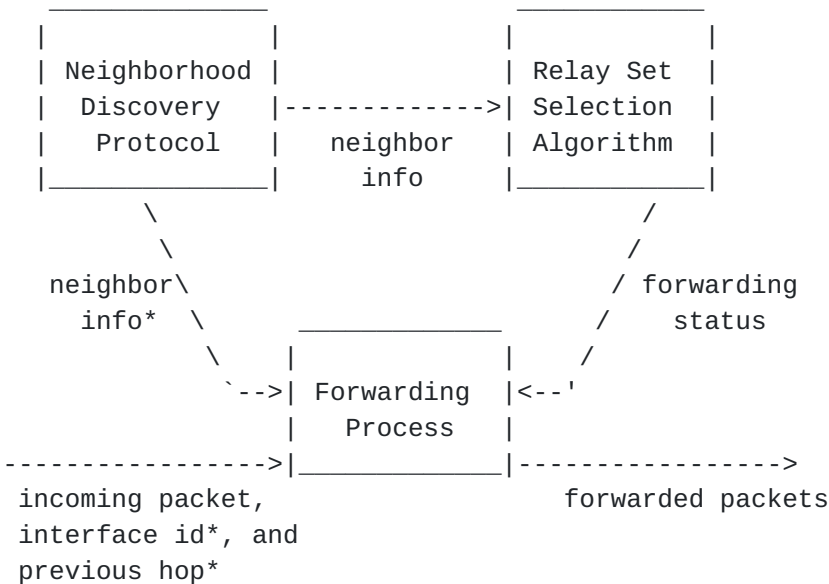


Figure 1: SMF Node Architecture

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 interface defined by this MIB.
- o Tunable Configuration Objects - objects whose values affect timing or attempt bounds on the SMF 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 multicasting 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-MIB.

- o smfMIBObjects - defines the objects forming the basis for the SMF-MIB. These objects are divided up by function into the following groups:
 - o
 - * 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 RSSA and the resulting multicast performance.
 - * State Group - Contains information describing the current state of the SMF RSSA process such as the Neighbor Table.
 - * Performance Group - Contains objects which help to characterize the performance of the SMF RSSA process, typically statistics counters.
- o smfMIBConformance - defines minimal and full conformance of implementations to this SMF-MIB.

5.1. Textual Conventions

The textual conventions defined within the SMF-MIB are as follows:

- 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 another 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 follow:

- 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.
- 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 is the SMF Type Message TLV may be included in the NHDP exchanges.
- o SMF Address Block TLV - if NHDP mode is selected, then is the SMF Address Block TLV should be included in the NHDP exchanges.

5.4. The State Group

The State Subtree reports current state information, e.g.,

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

5.5. The Performance Group

The Performance subtree 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:
- o

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

5.6. The Notifications Group

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

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 objects 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

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

```
IMPORTS
```

```
    MODULE-IDENTITY, OBJECT-TYPE, NOTIFICATION-TYPE,  
    Counter32, Integer32, TimeTicks, experimental  
        FROM SNMPv2-SMI -- [RFC2578]  
  
    TEXTUAL-CONVENTION, RowStatus, TruthValue  
        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]  
    ;
```

```
manetSmfMIB MODULE-IDENTITY
```

```
    LAST-UPDATED "201110021300Z" -- October 02, 2011
```

```
    ORGANIZATION "IETF MANET Working Group"
```

```
    CONTACT-INFO
```

```
        "WG E-Mail: manet@ietf.org"
```

```
        WG Chairs: ian.chakeres@gmail.com  
                  jmacker@nrl.navy.mil
```

```
    Editors:  Robert G. Cole  
              US Army CERDEC  
              Space and Terrestrial Communications  
              6010 Frankford Road  
              Aberdeen Proving Ground, MD 21005  
              USA  
              +1 443 395-8744  
              robert.g.cole@us.army.mil
```


<http://www.cs.jhu.edu/~rgcole/>

Joseph Macker
Naval Research Laboratory
Washington, D.C. 20375
USA
macker@itd.nrl.navy.mil

Brian Adamson
Naval Research Laboratory
Washington, D.C. 20375
USA
adamson@itd.nrl.navy.mil

Sean Harnedy
Booz Allen Hamilton
333 City Boulevard West
Orange, CA 92868
USA
+1 714 938-3898
harnedy_sean@bah.com"

DESCRIPTION

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

[SMF] Macker, J.(ed.),
Simplified Multicast Forwarding [draft-ietf-manet-smf-10](#),
March 06, 2010.

Copyright (C) The IETF Trust (2008). This version of this MIB module is part of RFC xxxx; see the RFC itself for full legal notices."

-- Revision History

REVISION "201110021300Z" -- October 02, 2011

DESCRIPTION

"Updated 6th revision of the draft of this MIB module published as [draft-ietf-manet-smf-mib-03.txt](#). The changes made in this revision include:

- Added some notes to the MIB module
- Clarified and defined default settings

"

REVISION "201101161300Z" -- January 16, 2011

DESCRIPTION

"Updated 5th revision of the draft of this MIB module published as

[draft-ietf-manet-smf-mib-02.txt](#). The changes made in this revision include:

- Added the Notification Group and cleaned up the Conformance section
- Completed the TEXTUAL CONVENTION for the smfOpMode.
- Completed the Description clauses of several objects within the MIB.
- Removed the routerPriority object.
- Added the definition of a smfRouterID object and associated smfRouterIDAddrType object.

"

REVISION "200910261300Z" -- October 26, 2009
DESCRIPTION

"Updated draft of this MIB module published as [draft-ietf-manet-smf-mib-01.txt](#). A few changes were made in the development of this draft. Specifically, the following changes were made:

- Updated the textual material, included section on IMPORTS, relationship to other MIBs, etc.

"

REVISION "200904211300Z" -- April 21, 2009
DESCRIPTION

"Updated draft of this MIB module published as [draft-ietf-manet-smf-mib-00.txt](#). A few changes were made in the development of this draft. Specifically, the following changes were made:

- Removed the smfGatewayFilterTable from this draft. It is a useful construct, e.g., an IPTABLES-MIB, but might best be handled as a separate MIB and worked within a security focused working group.
- Removed the smfReportsGroup. This capability is being replaced with a new and more general method for offline reporting. This is being worked as a new MIB module referred to as the REPORT-MIB.
- Rev'd as a new MANET WG document.

"

REVISION "200902271300Z" -- February 27, 2009
DESCRIPTION

"Updated draft of this MIB module published as [draft-cole-manet-smf-mib-02.txt](#). Fairly extensive revisions and additions to this MIB were made in this version. Specifically, the following changes were made in development of this version:

- added a Capabilities Group within the Objects Group to allow the device to report supported capabilities, e.g., RSSAs supported.
- added administrative status objects for device and interfaces
- added multicast address forwarding tables, both for configured (within Configuration Group) and discovered (within the State Group).
- added additional Performance counters related to DPD functions.
- Split up the performance counters into IPv4 and IPv6, for both global and per interface statistics.
- Split out the reports capability into a separate Reports Group under the Objects Group.

"

REVISION "200811031300Z" -- November 03, 2008

DESCRIPTION

"Updated draft of this MIB module published as [draft-cole-manet-smf-mib-01.txt](#). Added gateway filter table and reports capabilities following rmon."

REVISION "200807071200Z" -- July 07, 2008

DESCRIPTION

"Initial draft of this MIB module published as [draft-cole-manet-smf-mib-00.txt](#)."

-- RFC-Editor assigns XXXX

::= { experimental 998 } -- 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 it is performing SMF functions, and 'disabled' indicates that it is not."

```
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 - SMF performs its own relay set selection using information from an associated MANET NHDP process.

CDS-aware unicast routing operation - a coexistent unicast routing protocol provides dynamic relay set state based upon its own control plane CDS or neighborhood discovery information.

Cross-layer operation - SMF operates using neighborhood status and triggers from a cross-layer information base for dynamic relay set selection and maintenance

"

```
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

"

```
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 ::= { manetSmfMIB 0 }
smfMIBObjects       OBJECT IDENTIFIER ::= { manetSmfMIB 1 }
smfMIBConformance  OBJECT IDENTIFIER ::= { manetSmfMIB 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.
```

```
        "
```

```
    ::= { 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 Mode, CDS-aware Routing Mode,
        and Cross-layer 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.
    "
 ::= { smfCapabilitiesGroup 2 }

```

```

smfRssaCapabilitiesEntry OBJECT-TYPE
SYNTAX      SmfRssaCapabilitiesEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
    "Information about a particular RSSA
    algorithm."
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 [SMF]. The default for this is the
    Classical Flooding algorithm. All compliant
    SMF forwarders must support Classical Flooding.
    Hence, at least one entry in this table must
    exist with a smfRssaCapabilitiesID of '1'."
DEFVAL { 1 }
 ::= { 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:
Classical Flooding - cF,
Source-based MultiPoint
Relay - SMPR,
Essential Connecting Dominating
Set - eCDS,
MultiPoint Relay Connected
Dominating Set - 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.

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


```
        non-volatile storage.
    "
 ::= { smfConfigurationGroup 1 }

smfRouterIDAddrType OBJECT-TYPE
    SYNTAX      InetAddressType
    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.

        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.
    "
 ::= { smfConfigurationGroup 2 }

smfRouterID OBJECT-TYPE
    SYNTAX      InetAddress
    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 interoperating
        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.

"

::= { smfConfigurationGroup 3 }

smfConfiguredOpMode OBJECT-TYPE

SYNTAX INTEGER {
 withNHDP(1),
 cdsAwareRouting(2),
 crossLayer(3),
 other(4)
}

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"The SMF RSS node operational mode as defined in the TEXTUAL CONVENTION for `SmfOpModeID' and in [\[SMF\]](#)..

The value withNHDP(1) indicates Independent Mode of operation.

The value cdsAwareRouting(2) indicates CDS-aware Routing Mode of operation.

The value crossLayer(3) indicates Cross-layer Mode of operation.

The default value for this object is withNHDP(1).

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

"

DEFVAL { 1 }

::= { 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 [\[SMF\]](#).

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.

"

DEFVAL { 1 }

::= { 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.

"

DEFVAL { 1 }

::= { 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.
    "
    DEFVAL { 1 }
 ::= { 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.
    "
    DEFVAL { 1 }
 ::= { 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.
    "
    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.
    "
    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.
  "
  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.
    "
 ::= { 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.

"

::= { 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.

"


```
::= { 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 }
```

```
::= { smfConfiguredAddrForwardingTable 1 }
```

```
SmfConfiguredAddrForwardingEntry ::= SEQUENCE {
```

```
    smfConfiguredAddrForwardingAddrType      InetAddressType,
```

```
    smfConfiguredAddrForwardingFirstAddr     InetAddress,
```

```
    smfConfiguredAddrForwardingLastAddr     InetAddress,
```

```
    smfConfiguredAddrForwardingStatus       RowStatus
```

```
}
```

```
smfConfiguredAddrForwardingAddrType OBJECT-TYPE
```

```
SYNTAX      InetAddressType
```

```
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."
```

```
::= { smfConfiguredAddrForwardingEntry 1 }
```

```
smfConfiguredAddrForwardingFirstAddr OBJECT-TYPE
```

```
SYNTAX      InetAddress (SIZE(0..20))
```

```
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."
```

```
::= { smfConfiguredAddrForwardingEntry 2 }
```

```
smfConfiguredAddrForwardingLastAddr OBJECT-TYPE
```

```
SYNTAX      InetAddress (SIZE(0..20))
```

```
MAX-ACCESS read-create
```

```
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."
 ::= { 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.  If write
        access is supported, the other writable objects in this
        table may be modified even while the status is `active'."
 ::= { 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.

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



```
    INDEX { smfIfIndex }
 ::= { smfInterfaceTable 1 }

SmfInterfaceEntry ::=
    SEQUENCE {
        smfIfIndex          InterfaceIndexOrZero,
        smfIfAdminStatus   SmfStatus,
        smfIfRowStatus     RowStatus
    }

smfIfIndex OBJECT-TYPE
    SYNTAX      InterfaceIndexOrZero
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The ifIndex for this SMF interface."
 ::= { smfInterfaceEntry 1 }

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
        external to the SMF forwarding process.
        "
 ::= { smfInterfaceEntry 2 }

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."
 ::= { smfInterfaceEntry 3 }

--
-- 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."
```

```
::= { smfStateGroup 1 }
```

```
smfDpdMemoryOverflow OBJECT-TYPE
```

```
SYNTAX Counter32
```

```
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.  
"
```

```
::= { 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 address  
for forwarding.
```

```
Each row is associated with a range of  
multicast addresses, and ranges for different rows
```



```
        must be disjoint.
    "
 ::= { 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 }
    ::= { smfDiscoveredAddrForwardingTable 1 }

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

smfDiscoveredAddrForwardingAddrType OBJECT-TYPE
    SYNTAX      InetAddressType
    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."
    ::= { smfDiscoveredAddrForwardingEntry 1 }

smfDiscoveredAddrForwardingFirstAddr OBJECT-TYPE
    SYNTAX      InetAddress (SIZE(0..20))
    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."
    ::= { smfDiscoveredAddrForwardingEntry 2 }

smfDiscoveredAddrForwardingLastAddr OBJECT-TYPE
    SYNTAX      InetAddress (SIZE(0..20))
    MAX-ACCESS  read-create
    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."
 ::= { smfDiscoveredAddrForwardingEntry 3 }

--
-- SMF Neighbor Table
--

smfNeighborTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF SmfNeighborEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The SMF NeighborTable describes the
        current neighbor nodes, their address
        and SMF RSSA and the interface on which
        they can be reached."
    REFERENCE
        "Simplified Multicast Forwarding for MANET
        (SMF), Macker, J., July 2009.
        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 { smfNeighborIpAddressType,
            smfNeighborIpAddress,
            smfNeighborPrefixLen }
 ::= { smfNeighborTable 1 }

SmfNeighborEntry ::=
    SEQUENCE {
        smfNeighborIpAddressType      InetAddressType,
        smfNeighborIpAddress          InetAddress,
        smfNeighborPrefixLen          InetAddressPrefixLength,
        smfNeighborRSSA                SmfRssaID,
        smfNeighborNextHopInterface   InterfaceIndexOrZero
    }

```



```
smfNeighborIpAddrType OBJECT-TYPE
    SYNTAX      InetAddressType
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The neighbor IP address type."
 ::= { smfNeighborEntry 1 }

smfNeighborIpAddr OBJECT-TYPE
    SYNTAX      InetAddress
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The neighbor Inet IPv4 or IPv6 address."
 ::= { smfNeighborEntry 2 }

smfNeighborPrefixLen OBJECT-TYPE
    SYNTAX      InetAddressPrefixLength
    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
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "A counter of the total number of
        multicast IPv4 packets received by the
        device."
    ::= { smfGlobalPerfGroup 1 }

smfIpv4MultiPktsForwardedTotal OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "A counter of the total number of
        multicast IPv4 packets forwarded by the
        device."
    ::= { smfGlobalPerfGroup 2 }

smfIpv4DuplMultiPktsDetectedTotal OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "A counter of the total number of duplicate
        multicast IPv4 packets detected by the
        device."
    ::= { smfGlobalPerfGroup 3 }

smfIpv4DroppedMultiPktsTTLExceededTotal OBJECT-TYPE
```



```
SYNTAX      Counter32
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."
 ::= { smfGlobalPerfGroup 4 }

smfIpv4TTLLargerThanPreviousTotal  OBJECT-TYPE
SYNTAX      Counter32
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.
    "
 ::= { smfGlobalPerfGroup 5 }

--
-- IPv6 packet counters
--

smfIpv6MultiPktsRecvTotal  OBJECT-TYPE
SYNTAX      Counter32
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "A counter of the total number of
    multicast IPv6 packets received by the
    device."
 ::= { smfGlobalPerfGroup 6 }

smfIpv6MultiPktsForwardedTotal  OBJECT-TYPE
SYNTAX      Counter32
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "A counter of the total number of
    multicast IPv6 packets forwarded by the
    device."
 ::= { smfGlobalPerfGroup 7 }

smfIpv6DuplMultiPktsDetectedTotal  OBJECT-TYPE
SYNTAX      Counter32
MAX-ACCESS  read-only
STATUS      current
```


DESCRIPTION

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

::= { smfGlobalPerfGroup 8 }

smfIpv6DroppedMultiPktsTTLExceededTotal OBJECT-TYPE

SYNTAX Counter32

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."

::= { smfGlobalPerfGroup 9 }

smfIpv6TTLLargerThanPreviousTotal OBJECT-TYPE

SYNTAX Counter32

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."

"

::= { smfGlobalPerfGroup 10 }

smfIpv6HAVAssistsReqdTotal OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"A counter of the total number of IPv6 packets recieved which required the HAV assist for DPD."

"

::= { smfGlobalPerfGroup 11 }

smfIpv6DpdHeaderInsertionsTotal OBJECT-TYPE

SYNTAX Counter32

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."

"

::= { 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 statistics per
        interface."
    ::= { 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 { smfIpv4IfPerfIfIndex }
    ::= { smfIpv4InterfacePerfTable 1 }

SmfIpv4InterfacePerfEntry ::=
    SEQUENCE {
        smfIpv4IfPerfIfIndex          InterfaceIndexOrZero,
        smfIpv4MultiPktsRecvPerIf    Counter32,
        smfIpv4MultiPktsForwardedPerIf Counter32,
        smfIpv4DuplMultiPktsDetectedPerIf Counter32,
        smfIpv4DroppedMultiPktsTTLExceededPerIf Counter32,
        smfIpv4TTLLargerThanPreviousPerIf Counter32
    }

smfIpv4IfPerfIfIndex OBJECT-TYPE
    SYNTAX      InterfaceIndexOrZero
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The ifIndex for this node interface
        that is collecting this set of
        performance management statistics."
    ::= { smfIpv4InterfacePerfEntry 1 }

smfIpv4MultiPktsRecvPerIf OBJECT-TYPE
```



```
SYNTAX      Counter32
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "A counter of the number of
    multicast IP packets received by the
    device on this interface."
 ::= { smfIpv4InterfacePerfEntry 2 }

smfIpv4MultiPktsForwardedPerIf  OBJECT-TYPE
SYNTAX      Counter32
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "A counter of the number of
    multicast IP packets forwarded by the
    device on this interface."
 ::= { smfIpv4InterfacePerfEntry 3 }

smfIpv4DuplMultiPktsDetectedPerIf  OBJECT-TYPE
SYNTAX      Counter32
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "A counter of the number of duplicate
    multicast IP packets detected by the
    device on this interface."
 ::= { smfIpv4InterfacePerfEntry 4 }

smfIpv4DroppedMultiPktsTTLExceededPerIf  OBJECT-TYPE
SYNTAX      Counter32
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."
 ::= { smfIpv4InterfacePerfEntry 5 }

smfIpv4TTLLargerThanPreviousPerIf  OBJECT-TYPE
SYNTAX      Counter32
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 recieved identical packet.
    "
```



```
 ::= { smfIpv4InterfacePerfEntry 6 }
```

```
 smfIpv6InterfacePerfTable OBJECT-TYPE
```

```
   SYNTAX          SEQUENCE OF SmfIpv6InterfacePerfEntry
```

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

```
   STATUS          current
```

```
   DESCRIPTION
```

```
       "The SMF Interface Performance Table
        describes the SMF statistics per
        interface."
```

```
 ::= { smfInterfacePerfGroup 2 }
```

```
 smfIpv6InterfacePerfEntry OBJECT-TYPE
```

```
   SYNTAX          SmfIpv6InterfacePerfEntry
```

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

```
   STATUS          current
```

```
   DESCRIPTION
```

```
       "The SMF Interface Performance entry
        describes the statistics for a particular
        node interface."
```

```
   INDEX { smfIpv6IfPerfIfIndex }
```

```
 ::= { smfIpv6InterfacePerfTable 1 }
```

```
 SmfIpv6InterfacePerfEntry ::=
```

```
   SEQUENCE {
```

```
     smfIpv6IfPerfIfIndex          InterfaceIndexOrZero,
```

```
     smfIpv6MultiPktsRecvPerIf     Counter32,
```

```
     smfIpv6MultiPktsForwardedPerIf Counter32,
```

```
     smfIpv6DuplMultiPktsDetectedPerIf Counter32,
```

```
     smfIpv6DroppedMultiPktsTTLExceededPerIf Counter32,
```

```
     smfIpv6TTLLargerThanPreviousPerIf Counter32,
```

```
     smfIpv6HAVAssistsReqdPerIf    Counter32,
```

```
     smfIpv6DpdHeaderInsertionsPerIf Counter32
```

```
   }
```

```
 smfIpv6IfPerfIfIndex OBJECT-TYPE
```

```
   SYNTAX          InterfaceIndexOrZero
```

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

```
   STATUS          current
```

```
   DESCRIPTION
```

```
       "The ifIndex for this node interface
        that is collecting this set of
        performance management statistics.
```

```
       For packets generated locally at
        this node, performance counters
        are assigned to the loopback
```



```
        interface.  
        "  
 ::= { smfIpv6InterfacePerfEntry 1 }  
  
smfIpv6MultiPktsRecvPerIf OBJECT-TYPE  
    SYNTAX      Counter32  
    MAX-ACCESS  read-only  
    STATUS      current  
    DESCRIPTION  
        "A counter of the number of  
        multicast IP packets received by the  
        device on this interface."  
 ::= { smfIpv6InterfacePerfEntry 2 }  
  
smfIpv6MultiPktsForwardedPerIf OBJECT-TYPE  
    SYNTAX      Counter32  
    MAX-ACCESS  read-only  
    STATUS      current  
    DESCRIPTION  
        "A counter of the number of  
        multicast IP packets forwarded by the  
        device on this interface."  
 ::= { smfIpv6InterfacePerfEntry 3 }  
  
smfIpv6DuplMultiPktsDetectedPerIf OBJECT-TYPE  
    SYNTAX      Counter32  
    MAX-ACCESS  read-only  
    STATUS      current  
    DESCRIPTION  
        "A counter of the number of duplicate  
        multicast IP packets detected by the  
        device on this interface."  
 ::= { smfIpv6InterfacePerfEntry 4 }  
  
smfIpv6DroppedMultiPktsTTLExceededPerIf OBJECT-TYPE  
    SYNTAX      Counter32  
    MAX-ACCESS  read-only  
    STATUS      current  
    DESCRIPTION  
        "A counter of the number of dropped  
        multicast IP packets by the  
        device on this interface due to TTL  
        exceeded."  
 ::= { smfIpv6InterfacePerfEntry 5 }  
  
smfIpv6TTLlargerThanPreviousPerIf OBJECT-TYPE  
    SYNTAX      Counter32  
    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.
"
```

```
::= { smfIpv6InterfacePerfEntry 6 }
```

```
smfIpv6HAVAssistsReqdPerIf OBJECT-TYPE
```

```
SYNTAX      Counter32
```

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

```
STATUS      current
```

```
DESCRIPTION
```

```
"A counter of the total number of IPv6 packets
  recieved which required the HAV assist for DPD.
"
```

```
::= { smfIpv6InterfacePerfEntry 7 }
```

```
smfIpv6DpdHeaderInsertionsPerIf OBJECT-TYPE
```

```
SYNTAX      Counter32
```

```
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.
"
```

```
::= { smfIpv6InterfacePerfEntry 8 }
```

```
--
```

```
-- Notifications
```

```
--
```

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

```
smfMIBNotifObjects OBJECT IDENTIFIER ::= { smfMIBNotifications 2 }
```

```
smfMIBNotifStates OBJECT IDENTIFIER ::= { smfMIBNotifications 3 }
```

```
-- smfMIBNotifControl
```

```
smfSetNotification OBJECT-TYPE
```

```
SYNTAX      OCTET STRING (SIZE(4))
```

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

```
STATUS      current
```

```
DESCRIPTION
```

```
"A 4-octet string serving as a bit map for
  the notification events defined by the SMF MIB
```


notifications. This object is used to enable and disable specific SMF MIB notifications where a 1 in the bit field represents enabled. The right-most bit (least significant) represents notification 0.

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

"

::= { smfMIBNotifControl 1 }

smfDpdMemoryOverflowThreshold OBJECT-TYPE

SYNTAX Integer32 (0..255)

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.

"

::= { smfMIBNotifControl 2 }

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.

"

::= { smfMIBNotifControl 3 }

smfIpv4DuplMultiPktsDetectedTotalThreshold OBJECT-TYPE

SYNTAX Integer32 (0..255)

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"A threshold value for the
`smfIpv4DuplMultiPktsDetectedTotal'
object. If the number of occurrences
exceeds this threshold within the
previous number of seconds
`smfIpv4DuplMultiPktsDetectedTotalWindow',
then the
`smfIpv4DuplMultiPktsDetectedTotalEvent'
notification is sent.

"

::= { smfMIBNotifControl 4 }

smfIpv4DuplMultiPktsDetectedTotalWindow OBJECT-TYPE

SYNTAX TimeTicks
MAX-ACCESS read-write
STATUS current

DESCRIPTION

"A time window value for the
`smfIpv4DuplMultiPktsDetectedTotalEvents'
object. If the number of occurrences
exceeds the
`smfIpv4DuplMultiPktsDetectedTotalThreshold'
within the previous number of seconds
'smfIpv4DuplMultiPktsDetectedTotalWindow',
then the
`smfIpv4DuplMultiPktsDetectedTotalEvent'
notification is sent.

"

::= { smfMIBNotifControl 5 }

smfIpv6DuplMultiPktsDetectedTotalThreshold OBJECT-TYPE

SYNTAX Integer32 (0..255)
MAX-ACCESS read-write
STATUS current

DESCRIPTION

"A threshold value for the
`smfIpv6DuplMultiPktsDetectedTotal'
object. If the number of occurrences
exceeds this threshold within the
previous number of seconds
`smfIpv6DuplMultiPktsDetectedTotalWindow',
then the
`smfIpv6DuplMultiPktsDetectedTotalEvent'
notification is sent.

"

::= { smfMIBNotifControl 6 }


```

smfIpv6DuplMultiPktsDetectedTotalWindow OBJECT-TYPE
    SYNTAX      TimeTicks
    MAX-ACCESS  read-write
    STATUS      current
    DESCRIPTION
        "A time window value for the
        `smfIpv6DuplMultiPktsDetectedTotalEvents'
        object.  If the number of occurrences
        exceeds the
        `smfIpv6DuplMultiPktsDetectedTotalThreshold'
        within the previous number of seconds
        'smfIpv6DuplMultiPktsDetectedTotalWindow',
        then the
        `smfIpv6DuplMultiPktsDetectedTotalEvent'
        notification is sent.
        "
    ::= { smfMIBNotifControl 7 }

-- 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.
smfIfIndex, -- 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 }

smfIpv4DuplMultiPktsDetectedTotalEvents NOTIFICATION-TYPE
OBJECTS { smfRouterIDAddrType, -- The originator of
          -- the notification.
          smfRouterID, -- The originator of
          -- the notification.
          smfIpv4DuplMultiPktsDetectedTotal -- The
          -- counter of detected
          -- duplicates.
        }
STATUS      current
DESCRIPTION
  "smfIpv4DuplMultiPktsDetectedTotal is a
  notification sent when the number of
  IPv4 duplicate packets detected exceeds the
  'smfIpv4DuplMultiPktsDetectedTotalThreshold'
  during the previous number of seconds
  'smfIpv4DuplPktsDetectedTotalWindow'.
  "
 ::= { smfMIBNotifObjects 6 }

smfIpv6DuplMultiPktsDetectedTotalEvents NOTIFICATION-TYPE
OBJECTS { smfRouterIDAddrType, -- The originator of
          -- the notification.
          smfRouterID, -- The originator of
          -- the notification.
          smfIpv6DuplMultiPktsDetectedTotal -- The
          -- counter of detected
          -- duplicates.
        }
STATUS      current
DESCRIPTION
  "smfIpv6DuplMultiPktsDetectedTotal is a
  notification sent when the number of
  IPv6 duplicate packets detected exceeds the
  'smfIpv6DuplMultiPktsDetectedTotalThreshold'
  during the previous number of seconds
  'smfIpv6DuplPktsDetectedTotalWindow'.
  "
 ::= { smfMIBNotifObjects 7 }
```



```
-- smfMIBNotifStates
--   is empty.

--
-- 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,
        smfIfIndex,
        smfConfiguredOpMode,
        smfConfiguredRssa,
        smfRssaMember,
        smfIpv4Dpd,
        smfIpv6Dpd,
        smfMaxPktLifetime,
        smfDpdMaxMemorySize,
        smfDpdEntryMaxLifetime,
        smfNhdpRssaMesgTLVIncluded,
        smfNhdpRssaAddrBlockTLVIncluded,

        smfConfiguredAddrForwardingLastAddr,
        smfConfiguredAddrForwardingStatus,

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

```
smfStateObjectsGroup OBJECT-GROUP
    OBJECTS {
        smfNodeRsStatusIncluded,
        smfDpdMemoryOverflow,

        smfDiscoveredAddrForwardingLastAddr,

        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 {

smfSetNotification,
smfDpdMemoryOverflowThreshold,
smfDpdMemoryOverflowWindow,
smfIpv4DuplMultiPktsDetectedTotalThreshold,
smfIpv4DuplMultiPktsDetectedTotalWindow,


```

        smfIpv6DuplMultiPktsDetectedTotalThreshold,
        smfIpv6DuplMultiPktsDetectedTotalWindow
    }
    STATUS current
    DESCRIPTION
        "Set of SMF notification control
        objects implemented in this module."
 ::= { smfMIBGroups 5 }

smfNotificationsGroup NOTIFICATION-GROUP
    NOTIFICATIONS {
        smfAdminStatusChange,
        smfConfiguredOpModeChange,
        smfConfiguredRssaChange,
        smfIfAdminStatusChange,
        smfDpdMemoryOverflowEvent,
        smfIpv4DuplMultiPktsDetectedTotalEvents,
        smfIpv6DuplMultiPktsDetectedTotalEvents
    }
    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 multicasting 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 consistent across interoperating 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.

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

Further, deployment of SNMP versions prior to SNMPv3 is NOT RECOMMENDED. Instead, it is RECOMMENDED to deploy SNMPv3 and to enable cryptographic security. It is then a customer/operator responsibility to ensure that the SNMP entity giving access to an instance of this MIB module is properly configured to give access to the objects only to those principals (users) that have legitimate rights to indeed GET or SET (change/create/delete) them.

9. IANA Considerations

Editor's Note (to be removed prior to publication): the IANA is requested to assign a value for "XXXX" under the 'experimental' subtree and to record the assignment in the SMI Numbers registry. When the assignment has been made, the RFC Editor is asked to replace "XXXX" (here and in the MIB module) with the assigned value and to remove this note. Note well: prior to official assignment by the IANA, a draft document MUST use placeholders (such as "XXXX" above) rather than actual numbers. See [RFC4181 Section 4.5](#) for an example of how this is done in a draft MIB module.

10. 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.

11. References

11.1. Normative References

- [RFC2863] McCloghrie, K. and F. Kastenholz, "The Interfaces Group MIB", [RFC 2863](#), June 2000.
- [RFC3411] Harrington, D., Presuhn, R., and B. Wijnen, "An Architecture for Describing Simple Network Management Protocol (SNMP) Management Frameworks", STD 62, [RFC 3411](#), December 2002.
- [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.
- [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", [BCP 14](#), [RFC 2119](#), March 1997.
- [RFC2578] McCloghrie, K., Ed., Perkins, D., Ed., and J. Schoenwaelder, Ed., "Structure of Management Information Version 2 (SMIV2)", STD 58, [RFC 2578](#), April 1999.
- [RFC2579] McCloghrie, K., Ed., Perkins, D., Ed., and J. Schoenwaelder, Ed., "Textual Conventions for SMIV2", STD 58, [RFC 2579](#), April 1999.
- [RFC2580] McCloghrie, K., Perkins, D., and J. Schoenwaelder, "Conformance Statements for SMIV2", STD 58, [RFC 2580](#), April 1999.
- [I-D.ietf-manet-smf] Macker, J., "Simplified Multicast Forwarding", [draft-ietf-manet-smf-12](#) (work in progress), July 2011.

11.2. Informative References

- [RFC3410] Case, J., Mundy, R., Partain, D., and B. Stewart, "Introduction and Applicability Statements for Internet-Standard Management Framework", [RFC 3410](#), December 2002.

Appendix A. Change Log

This section tracks the revision history in the development of this SMF-MIB. It will be removed from the final version of this document.

These changes were made from [draft-ietf-manet-smf-mib-02](#) to [draft-ietf-manet-smf-mib-03](#).

1. Clarified and added discussion of default values for several of the configuration objects within the MIB.
2. Added the security section.

These changes were made from [draft-ietf-manet-smf-mib-01](#) to [draft-ietf-manet-smf-mib-02](#).

1. Added the NotificationGroup to the MIB and updated the ConformanceGroup.
2. Added the definition of an smfRouterID to the MIB. This is later used in the Notifications to indicate the origin of the event to the management station.
3. Removed the Router Priority object as this was used only in the eCDS algorithm and hence should be contained within the future eCDS-MIB.
4. Cleaned up the TEXTUAL CONVENTION for the `SmfOpMode`.
5. Filled in some of the missing text in various object descriptions.

These changes were made from [draft-ietf-manet-smf-mib-00](#) to [draft-ietf-manet-dsmf-mib-01](#).

1. Editorial changes to the textual material. These included the addition of the paragraphs on TEXTUAL-CONVENTIONS defined and imported into this MIB and relationships to other MIBs.
2. Identified those objects in the SMF-MIB requiring non-volatile storage.

- 3. Changed the name of the TEXTUAL-CONVENTION 'Status', defined within this MIB to 'SmfStatus'.

Appendix B. Open Issues

This section contains the set of open issues related to the development and design of the SMF-MIB. This section will not be present in the final version of the MIB and will be removed once all the open issues have been resolved.

- 1. A careful review by the working group.

Appendix C.

```

*****
* Note to the RFC Editor (to be removed prior to publication) *
*                                                                 *
* 1) The reference to RFCXXXX within the DESCRIPTION clauses *
* of the MIB module point to this draft and are to be         *
* assigned by the RFC Editor.                                  *
*                                                                 *
* 2) The reference to RFCXXX2 throughout this document point *
* to the current draft-ietf-manet-smf-xx.txt. This *
* need to be replaced with the XXX RFC number.                *
*                                                                 *
*****

```

Authors' Addresses

Robert G. Cole
 US Army CERDEC
 6010 Frankford Road
 Aberdeen Proving Ground, Maryland 21005
 USA

Phone: +1 443 395 8744
 EMail: robert.g.cole@us.army.mil
 URI: <http://www.cs.jhu.edu/~rgcole/>

Joseph Macker
 Naval Research Laboratory
 Washington, D.C. 20375
 USA

EMail: macker@itd.nrl.navy.mil

Brian Adamson
Naval Research Laboratory
Washington, D.C. 20375
USA

E-Mail: adamson@itd.nrl.navy.mil

Sean Harnedy
Booz Allen Hamilton
333 City Boulevard West
Orange, CA 92868
USA

E-Mail: harnedy_sean@bah.com

