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R. Cole
US Army CERDEC
J. Macker
Naval Research Laboratory
A. Bierman
YumaWorks, Inc.
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Definition of Managed Objects for Performance Reporting draft-ietf-manet-report-mib-04

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 autonomous report generation on any device that supports MIBs containing objects that resolve to type Integer32 (i.e., Integer32, Counter, Gauge, or TimeTicks). to be used for performance monitoring. This allows a management station to instruct a device to build off-line reports to be collected either through notifications to the management station or quiried asynchronously by the management station. Hence, this capability allows network operators to reduce the SNMP polling traffic burden on Mobile Ad-Hoc and Disruption Tolerant Networks which is problematic of SNMP performance management applications.

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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 autonomous, off-line report generation for performance monitoring on any device supporting MIBs containing variables that resolve to type Integer32 (i.e., Integer32, Counter, Gauge, or TimeTicks). This reportSampledMIB module allows for the report generation to occur on the same device as containing the referenced counter object. This should be useful to devices or networks where efficient use of bandwidth is of concern or where intermittent connectivity is common. Hence, the reportSampledMIB module is useful for devices managed over some Mobile Ad-Hoc Networks (MANETs) or Disruption Tolerant Networks (DTNs).

This version of the reportSampledMIB module offers one type of off-line reporting. The MIB offers a means to collect sampled measurements related to defined MIB objects. This type of reporting is contained in the reportSampledMibObjects. Other types of report data are possible, including statistical data. However, it was felt wise to focus on a more limited scope off-line reporting capability and gain experimental use and application prior to expending energy developing a more extensive off line reporting capability.

The reportSampledMIB module relies upon the dismanEventMIB module RFC 2981 [RFC2981] to monitor the progress of reports being developed within the reportSampledMIB module and to trigger an events, i.e., notifications containing reports, at the appropriate times. This is discussed below in more detail in the section entitled 'Relationship to the DISMAN-EVENT-MIB'. Further, more sophisticated performance objects for monitoring from the reportSampledMIB module can be defined through the dismanExpressionMIB module RFC 2982 [RFC2982]

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

The reportSampledMIB module references performance objects in other MIBs and generates off-line performance reports related to those referenced objects. The reportSampledMIB module can be coincident with the other MIB modules on the same device containing the referenced performance related object.

4.1. reportSampledMIB Module Management Model

This section describes the management model for the reportSampledMIB module process.

The reportSampledMIB module objects are primarily contained within four tables. These are:

- reportSampledControlTable - this is the control table within the reportSampledMIB module. This identifies the OIDs to be monitored which define the core of the Reports. The control table sets the sampling frequency for the Measurements and the number of Measurements that will define each Report.

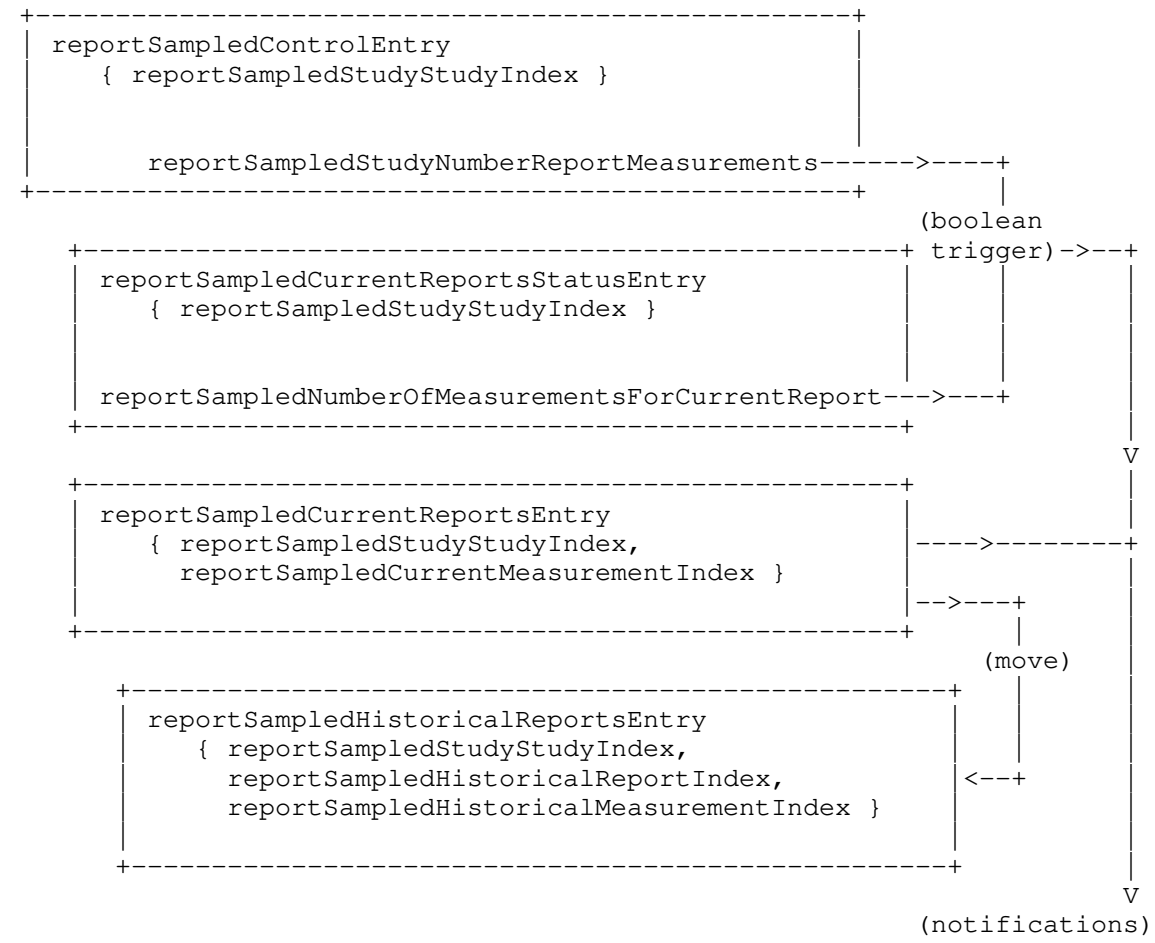
- reportSampledCurrentReportsStatusTable - This table tracks the status, i.e., the current number of collected Measurements per each Study. This information can be used by the dismanEventMIB module to determine when to trigger a notification to the Report owner containing the Measurements and associated data comprising the just completed Report.

- reportSampledCurrentReportsTable - This table holds the Measurements for the Reports which are in current development.

- reportSampledHistoricalReportsTable - This table holds the completed Reports for each Study for archival purposes, i.e., the Study owners can perform table walks to retrieve archived Reports or Studies.

The below figure illustrates the four main tables within the reportSampledMIB module. Further, if the dismanEventMIB module is so configured to generate triggered notifications, the below figure highlights the 'boolean trigger' and the notification generation. The figure futher illustrates the movement of completed Reports from

the reportSampledCurrentReportsTable to the reportSampledHistoricalReportsTable upon Report Completion.



4.2. Terms

The following definitions apply throughout this document:

- Sampled - periodic measurement of target OIDs.
- Measurement - a single instance of a sampling event.
- Report - a collection of consecutive Measurements on the same Sampled target OID.

- Study - a series of Reports on the same Sampled target OID.
- Current Report - a Report which is in the process of being developed.
- A Completed Report - contains a pre-defined number of Sampled Measurements.
- Historical Report - a Report which has previously Completed, and is being stored locally for archival purposes.

5. Structure of the MIB Module

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

- reportSampledMibNotifications - defines the notifications associated with the reportSampledMIB module. These objects define notifications which track the behavior of the reportSampledMib module. A single notification is defined in the reportSampledMIB mudule which reports a series of failed measurement attempts in the process of building a Report. Associated with this notification is a control object which defines a threshold of failures which would initiate the notification. These notifications do not cover the triggered notifications which carry the performance Reports generated by the reportSampledMib module. These triggered notifications are defined through the use of the dismanEventMIB module.
- reportSampledMibObjects - defines the objects forming the basis for the reportSampledMIB module. These objects are basically divided up by function into the following four tables:
  * reportSampledControlTable - This group contains the objects which support the generation (collection) of Studies comprising of Reports exposing sampled Measurement values.
  * reportSampledCurrentReportsStatusTable - This group contains the objects which track the collection of Measurements for current (in-progress) Reports. This table allows the dismanEventMIB module to set triggers for Completed Reports which it can then send to the report owner through triggered notifications.
  * reportSampledCurrentReportsTable - This group contains the objects which represent the Measurement data associated with Current (in-progress) Reports. Once the Report completes, it is moved to the reportSampledHistoricalReportsTable for

archival purposes.

* reportSampledHistoricalReportsTable - This group contains the objects which represent archived Completed Reports. This allows the report owners to asynchronously retrive Reports via table walks if so desired.

- reportSampledMibConformance - Defines a single basic conformance of implementations of this reportSampledMIB module.

5.1. Textual Conventions

No textual conventions are defined in the reportSampledMIB module.

5.2. Tables and Indexing

The reportSampledMIB module contains four tables which control and record data related to the creation, notification and storage of Reports. Specifically:

- the control and generation of remote performance Reports, i.e., reportSampledControlTable

- the status of the Current Reports' development, i.e., reportSampledCurrentReportsStatusTable,

- the Current Reports development and interim data, i.e., reportSampledCurrentReportsTable, and

- the historical storage of remote performance Reports, i.e. reportSampledHistoricalReportsTable.

The reportSampledMIB module's tables are indexed via the following constructs:

- reportSampledStudyIndex - an index that uniquely identifies a particular Study. The Study is comprised of multiple Reports, the number of Reports being stored is defined by the reportSampledStudyMaximumNumberOfHistoricalReports object.

- reportSampledCurrentMeasurementIndex - an index that uniquely identifies an atomic Measurement associated with a Report.

- reportSampledHistoricalReportIndex - an index that uniquely identifies an archived Completed Report resident within the reportSampledHistoricalReportsTable.

- reportSampledHistoricalMeasurementIndex - an index that uniquely identifies an atomic Measurement comprising an archived Completed Report.

These tables and their indexing are:

- reportSampledControlTable - this table contains a list of data-collection configuration entries defining aspects of the studies and their reports to be generated. These include, e.g., number of reports per study, the number Reports to be acrhived, etc. This table has 'INDEX { reportSampledStudyIndex }'.

- reportSampledCurrentReportsStatusTable - this table contains objects which track the development of current Reports, e.g., the number of current Measurements collected for each Report under development. This table has 'INDEX { reportSampledStudyIndex }'. For each (active) Study, there exists only one Current Report under development.

- reportSampledCurrentReportsTable - this table contains the Measurements which are developing the Current Reports. This table has 'INDEX { reportSampledStudyIndex, reportSampledCurrentMeasurementIndex }'.

- reportSampledHistoricalReportsTable - this table contains the Reports which have completed. This table has 'INDEX { reportSampledStudyIndex, reportSampledHistoricalReportIndex, reportSampledHistoricalMeasurementIndex }'.

6. Relationship to Other MIB Modules

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

6.1. Relationship to the SNMPv2-MIB

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

6.2. Relationship to the RMON2-MIB

The reportSampledMIB module is closely related to and was insired by the the RMON2-MIB module [RFC2021] usrHistoryGroup. The use of control tables to establish the periodic collection of measurement data for creation of performance reports was pulled from earlier work on the RMON2-MIB module.

6.3. Relationship to the DISMAN-EVENT-MIB

The reportSampledMIB module was developed to fundamentally work with the dismanEventMIB module RFC 2981 [RFC2981] in order to offer a complete and efficient off-line reporting capability for bandwidth challenged networks such as Mobile Ad-Hoc Networks (MANETs). This is accomplished through defining trigger test and associated notification actions indexed by mteOwner, mteTriggerName, mteObjectsName and mteEventName within the dismanEventMIB module. Specifically (within the dismanEventMIB module):

In the mteTriggerTable and specifically by setting

- 'mteTriggerTest == boolean(1)',
- 'mteTriggerSampleType == absoluteValue(1)',
- 'mteTriggerValueID == reportSampledNumberOfMeasurementsForCurrentReport',
- 'mteTriggerValueIDWildcard == false(1)',
- 'mteTriggerFrequency == 0.5*reportSampledStudySamplingInterval', and
- 'mteTriggerEnabled == true'.

In the mteTriggerBooleanTable and specifically by setting

- 'mteTriggerBooleanComparison == equal(2)',
- 'mteTriggerBooleanValue == value of reportSampledStudyNumberReportMeasurements', and
- 'mteTriggerBooleanStartup == false'.

In the mteObjectsTable and specifically by setting

- 'mteObjectsID == reportSampledCurrentMeasurementValue' and reportSampledCurrentMeasurementTime' and reportSampledCurrentMeasurementStatus' with
- 'mteObjectsIDWildcard == true' // for each.

In the mteEventTable and specifically by setting

- 'mteEventActions == notification(0)' and
- 'mteEventEnabled == true' // for each.

In the mteEventNotificationTable and specifically by setting

- 'mteEventNotification == mteTriggerFired' and the appropriate names for the
- 'mteEventNotificationObjectOwner == mteOwner' and
- 'mteEventNotificationObjects == mteObjectsName'.

These settings within the dismanEventMIB module will result in notifications generated by the dismanEventMIB module which will carry the recently completed reportSampledMIB module reports.

Set up properly, the dismanEventMIB module will trigger a notification each time the reportSampledCurrentTable contains a completed Report. This Report will be sent in a notification containing three columns of the reportSampledCurrentTable, i.e., the Value, the Time and the Status, due to the use of wildcarding within the dismanEventMIB module.

Simultaneously, the reportSampledMIB module will move the completed Current Report into the reportSampledHistoricalReportsTable and restart collection for the next Report within the reportSampledCurrentReportsTable.

6.4. Relationship to the DISMAN-EXPRESSION-MIB

In conjunction with the dismanExpressionMIB module RFC 2982 [RFC2982], the reportSampledMIB module can be used to develop reports on relatively sophisticated object expressions.

6.5. MIB modules required for IMPORTS

Citations are not permitted within a MIB module, but any module mentioned in an IMPORTS clause or document mentioned in a REFERENCE clause is a Normative reference, and must be cited someplace within

the narrative sections. Therefore, the imported items in this MIB module, such as Textual Conventions, that are not already cited, are cited in this section. Since relationships to other MIB modules should be described in the narrative text, this section will cite modules from which Textual Conventions are imported.

The reportSampledMIB module IMPORTS objects from SNMPv2-SMI [RFC2578], SNMPv2-TC [RFC2579], SNMPv2-CONF [RFC2580], SNMP-FRAMEWORK-MIB [RFC3411], and SNMPv2-MIB [RFC3418].

7. Definitions

```
REPORT-SAMPLED-MIB DEFINITIONS ::= BEGIN

IMPORTS

   MODULE-IDENTITY, OBJECT-TYPE, NOTIFICATION-TYPE,
   Gauge32, Integer32, experimental
      FROM SNMPv2-SMI                          -- [RFC2578]

   TimeStamp
      FROM SNMPv2-TC                           -- [RFC2579]

   sysUpTime
      FROM SNMPv2-MIB                          -- [RFC3418]

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

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


reportSampledMIB MODULE-IDENTITY
   LAST-UPDATED "201412011300Z"  -- December 01, 2014
   ORGANIZATION "IETF MANET Working Group"
   CONTACT-INFO
      "WG E-Mail: manet@ietf.org

       WG Chairs: sratliff@cisco.com
                  jmacker@nrl.navy.mil


       Editors:   Robert G. Cole
                  US Army CERDEC
```

6010 Frankford Road
Aberdeen Proving Ground, MD 21005
USA
+1 443 395-8744
robert.g.cole@us.army.mil

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

Andy Bierman
YumaWorks, Inc.
andy@yumaworks.com"

```
   DESCRIPTION
      "This MIB module contains managed object definitions for
       the autonmous reporting of performance object counters.
       Copyright (C) The IETF Trust (2009). This version
       of this MIB module is part of RFC xxxx; see the RFC
       itself for full legal notices."

     -- Revision History
     REVISION    "201412011300Z"   -- December 01, 2014
     DESCRIPTION
        "The ninth draft of this MIB module published as
         draft-ietf-manet-report-mib-04.txt.

         Revisions to this draft include
         a) A major restructuring of the MIB module in order
            to leverage the dismanEventMIB module for the
            automatic notification of Completed Reports.
         b) Efforts to incorporate this MIB module
            into the DISMAN management architecture.
        "
     REVISION    "201211051300Z"   -- November 05, 2012
     DESCRIPTION
        "The seventh draft of this MIB module published as
         draft-ietf-manet-report-mib-03.txt.

         Revisions to this draft include
         a) Added a 'Tables and Indexing' section to the
            body of this document.
         b) Added an 'Applicability Statement' section
            to the body of this document."
     REVISION    "201201311300Z"   -- January 31, 2012
     DESCRIPTION
        "The sixth draft of this MIB module published as
```

```
        draft-ietf-manet-report-mib-02.txt.

        Revisions to this draft include
        a) Pulled the statistical and historical reporting
           from the MIB module and left only the sampled
           reporting, in order to greatly simplify the
           first instance of this reporting MIB module.
        b) Renamed the module, the reportSampledMIB module.
        c) Leveraged the RMON2-MIB module more effectively
           through the use of the AUGMENTS clause.
        d) Changed the module to 'experimental'."
    REVISION    "201102171300Z"   -- February 17, 2011
    DESCRIPTION
       "The fifth draft of this MIB module published as
        draft-ietf-manet-report-mib-01.txt.  This document
        has been promoted to a MANET Working Group
        draft.

        Revisions to this draft include
        a) Proposed changes to the statsReport table to
           simplify communications between device and
           mgmt application,
        b) Added Notifications,
        c) Changed the reporting structure of the
           Sampled and the History reporting
           to align with the structure of the
           Statistics reports for the purpose of
           allowing for efficient notification and
           collection of data reports.
        d) Ran through smilint to clean up all errors
           and most warning.  A few still remain."
    REVISION    "201007051300Z"   -- July 05, 2010
    DESCRIPTION
       "The fourth draft of this MIB module published as
        draft-ietf-manet-report-mib-00.txt.  This document
        has been promoted to a MANET Working Group
        draft.

        Significant revisions to this draft include
        a) added support for proxy configurations through
        the addition of address objects associated with
        the referenced counter objects associated with the
        performance reports."
    REVISION    "201003021300Z"   -- March 02, 2010
    DESCRIPTION
       "The third draft of this MIB module published as
        draft-cole-manet-report-mib-02.txt.  Significant
        revisions to this draft include a) changed naming
```

```
         of usrHistoryGroup to sampledGroup and  b) added
         a historyGroup."
     REVISION    "200910251300Z"   -- October 25, 2009
     DESCRIPTION
        "The second draft of this MIB module published as
         draft-cole-manet-report-mib-01.txt.  Significant
         revisions to this draft include a) the inclusion of
         raw data collection borrow blatently from the
         usrHistory Group within RMON2, b) the deletion of
         the CurrentHistoryTable from version -00,
         c) modifications to the overall structure of the
         MIB, and d) the definition of various Compliance
         options for implementations related to this MIB."
     REVISION    "200904281300Z"   -- April 28, 2009
     DESCRIPTION
        "Initial draft of this MIB module published as
         draft-cole-manet-report-mib-00.txt."
     -- RFC-Editor assigns XXXX
     ::= { experimental 998 }   -- to be assigned by IANA



-- TEXTUAL CONVENTIONs
-- None

--
-- Top-Level Object Identifier Assignments
--
reportSampledMibNotifications OBJECT IDENTIFIER
                              ::= { reportSampledMIB 0 }
reportSampledMibObjects       OBJECT IDENTIFIER
                              ::= { reportSampledMIB 1 }
reportSampledMibConformance   OBJECT IDENTIFIER
                              ::= { reportSampledMIB 2 }

-- The reportSampledMibObjects assignments are :
--        reportSampledControlTable               - 1
--        reportSampledCurrentReportsStatusTable  - 2
--        reportSampledCurrentReportsTable        - 3
--        reportSampledHistoricalReportsTable     - 4


--
-- The Control Table
--
reportSampledControlTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF reportSampledControlEntry
    MAX-ACCESS  not-accessible
```

```
    STATUS      current
    DESCRIPTION
        "A table to configure measurement Studies which
         are comprised of multiple Reports."
    REFERENCE
        "tbd."
    ::= { reportSampledMibObjects 1 }

reportSampledControlEntry OBJECT-TYPE
    SYNTAX      ReportSampledControlEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "A list of parameters that control the creation of
         off-line performance Studies.

         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 reportSampledStudyEntryStatus
         object."
    INDEX       { reportSampledStudyIndex }
    ::= { reportSampledControlTable 1 }

ReportSampledControlEntry ::= SEQUENCE {
    reportSampledStudyIndex                              Integer32,
    reportSampledStudyOwner                              SnmpAdminString,
    reportSampledStudyName                               SnmpAdminString,
    reportSampledStudyOid                                Integer32,
    reportSampledStudySamplingInterval                   Integer32,
    reportSampledStudyNumberReportMeasurements           Integer32,
    reportSampledStudyMaximumNumberOfHistoricalReports   Integer32,
    reportSampledStudyEntryStatus                        RowStatus
}

reportSampledStudyIndex OBJECT-TYPE
    SYNTAX      Integer32 (1..127)
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "A unique index that identifies a specific performace
         Study.  Each Study is comprised of multiple
         Reports.  Each Report is comprised of multiple
         atomic Measurements on a specified object."
    ::= { reportSampledControlEntry 1 }

reportSampledStudyOwner OBJECT-TYPE
```

```
    SYNTAX      SnmpAdminString (SIZE (0..32))
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
        "The owner of the Study."
    DEFVAL      { ''H }
    ::= { reportSampledControlEntry 2 }

reportSampledStudyName OBJECT-TYPE
    SYNTAX      SnmpAdminString (SIZE (0..32))
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
        "The name of the Study."
    DEFVAL      { ''H }
    ::= { reportSampledControlEntry 3 }

reportSampledStudyOid OBJECT-TYPE
    SYNTAX      OBJECT IDENTIFIER
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
        "The target OID of the Study.  Each Study makes
         periodic Measurements on a specified object
         which is local to this device.  Currently, the
         objects of study are limited to objects that
         resolve to Integer32 (i.e., Integer32, Counter,
         Gauge, or TimeTicks)."
    ::= { reportSampledControlEntry 4 }

reportSampledStudySamplingInterval OBJECT-TYPE
    SYNTAX      Integer32 (1..2147483647)
    UNITS       "seconds"
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
        "The time (in seconds) between sampled Measurement
        instances."
    DEFVAL      { 10 }
    ::= { reportSampledControlEntry 5 }

reportSampledStudyNumberReportMeasurements OBJECT-TYPE
    SYNTAX      Integer32 (1..2147483647)
    UNITS       "count"
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
        "The number of Meaurements per Report for this Study."
```

```
    DEFVAL      { 10 }
    ::= { reportSampledControlEntry 6 }

reportSampledStudyMaximumNumberOfHistoricalReports OBJECT-TYPE
    SYNTAX      Integer32 (1..2147483647)
    UNITS       "count"
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
        "The number of Historical Reports to archive locally
         for this specific Study.  The Hostorical Reports are
         archived locally in the
         reportSampledHistoricalReportsTable (below)."
    DEFVAL      { 10 }
    ::= { reportSampledControlEntry 7 }

reportSampledStudyEntryStatus OBJECT-TYPE
    SYNTAX      RowStatus
    MAX-ACCESS  read-create
    STATUS current
    DESCRIPTION
        "This object permits management of this 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' 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 these objects in order
         for the row to transit to the 'active' state; the default
         value for these objects is used.  For objects that do not
         have DEFVAL clauses, then the network manager MUST
         specify the value of these objects prior to this row
         transitioning to the 'active' state.

         When this object transitions to 'active', 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 smfCfgIfRowStatus of 'active'
         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', all associated
         entries in the reportSampledCurrentReportsStatusTable,
```

```
         the reportSampledCurrentReportsTable, and the
         reportSampledHistoricalReportsTable MUST be deleted."
    ::= { reportSampledControlEntry 8 }


--
-- the Current Reports Status Table
--
reportSampledCurrentReportsStatusTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF reportSampledCurrentReportsStatusEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "A table to tracking the progress of measurements of current
         reports in development.  Of particular note is the object
         reportSampledNumberOfMeasurementsForCurrentReport which
         can be compared to the value of the object
         reportSampledStudyNumberReportMeasurements by the
         dismanEventMIB module and generate triggered
         notifications to the Study owner containing the
         recently Completed Reports."
    REFERENCE
        "tbd."
    ::= { reportSampledMibObjects 2 }

reportSampledCurrentReportsStatusEntry OBJECT-TYPE
    SYNTAX      ReportSampledCurrentReportsStatusEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "A list of parameters that track the status of
         current Reports in development."
    INDEX       { reportSampledStudyIndex }
    ::= { reportSampledCurrentReportsStatusTable 1 }

ReportSampledCurrentReportsStatusEntry ::= SEQUENCE {
    reportSampledNumberOfCurrentReport                 Integer32,
    reportSampledNumberOfMeasurementsForCurrentReport  Integer32
}

reportSampledNumberOfCurrentReport OBJECT-TYPE
    SYNTAX      Integer32 (1..2147483647)
    UNITS       "count"
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number within the Study series of this
         current Report.  For each new Report within
```

```
          the Study, this value MIUST increment by
          one.  For the first Report in this Study,
          the initial value of this object MUST be
          set to one.  The value MUST wrap back to one
          when the value has reached the maximum."
      ::= { reportSampledCurrentReportsStatusEntry 1 }

reportSampledNumberOfMeasurementsForCurrentReport OBJECT-TYPE
      SYNTAX      Integer32 (1..2147483647)
      UNITS       "count"
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
          "The number of Measurements collected so far for
           for this specific Report.  The initial value
           of this object MUST be one.  The value MUST
           increment be one for each attempted Measurement.
           The maximum value for this object is
           reportSampledStudyNumberReportMeasurements.
           Once this value is reached and the next
           Measurement is attempted, the Current Report is
           considered Completed, the agent MUST copy
           the Completed Report's data from the
           reportSampledCurrentReportsTable into the
           reportSampledHistoricalReportsTable, and the
           next Measurement (strating the next Report in the
           Study series) MUST be numbered with the value of
           this object as one."
      ::= { reportSampledCurrentReportsStatusEntry 2 }


--
-- the Current Reports Table
--
reportSampledCurrentReportsTable OBJECT-TYPE
      SYNTAX      SEQUENCE OF ReportSampledCurrentReportsEntry
      MAX-ACCESS  not-accessible
      STATUS      current
      DESCRIPTION
          "A list of measurements being collected for active
           Reports."
      REFERENCE
          " TBD."
      ::= { reportSampledMibObjects 3 }

reportSampledCurrentReportsEntry OBJECT-TYPE
      SYNTAX      ReportSampledCurrentReportsEntry
      MAX-ACCESS  not-accessible
```

```
    STATUS      current
    DESCRIPTION
        "A list of entries storing the measurements from
         active Reports.  Once an active, current Report
         completes (when the value of the associated
         reportSampledNumberOfMeasurementsForCurrentReport
         equals the value of the associated
         reportSampledStudyNumberReportMeasurements), the
         agent MUST move the Report's data from the
         reportSampledCurrentReportsTable to the
         reportSampledHistoricalReportTable."
    INDEX       { reportSampledStudyIndex,
                  reportSampledCurrentMeasurementIndex }
    ::= { reportSampledCurrentReportsTable 1 }

ReportSampledCurrentReportsEntry ::= SEQUENCE {
    reportSampledCurrentMeasurementIndex  Integer32,
    reportSampledCurrentMeasurementValue  Integer32,
    reportSampledCurrentMeasurementTime   sysUpTime,
    reportSampledCurrentMeasurementStatus INTEGER
}

reportSampledCurrentMeasurementIndex  OBJECT-TYPE
    SYNTAX      Integer32 (1..2147483647)
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "An index for this table which represents
         the number of Measurements collected so far for
         for this current Report.  The initial value
         of this object MUST be one.  The value MUST
         increment be one for each attempted Measurement.
         The maximum value for this object is
         reportSampledStudyNumberReportMeasurements.
         Once this value is reached and the next
         Measurement is attempted, the Current Report is
         considered Completed, the agent MUST copy
         the Completed Report's data from the
         reportSampledCurrentReportsTable into the
         reportSampledHistoricalReportsTable, and the
         next Measurement (strating the next Report in the
         Study series) MUST be numbered with the value of
         this object as one."
    ::= { reportSampledCurrentReportsEntry 1 }

-- (RGC: start descriptions here)
reportSampledCurrentMeasurementValue  OBJECT-TYPE
    SYNTAX      Integer32 (1..2147483647)
```

```
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "A single measurement for this Study for
         this Report ...."
    ::= { reportSampledCurrentReportsEntry 2 }

reportSampledCurrentMeasurementTime  OBJECT-TYPE
    SYNTAX      sysUpTime
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The systemUpTime of the device on which the
         measurement was made for this Measurement ...."
    ::= { reportSampledCurrentReportsEntry 3 }

reportSampledCurrentMeasurementStatus OBJECT-TYPE
    SYNTAX INTEGER {
        valueNotAvailable(1),
        valuePositive(2),
        valueNegative(3)
    }
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "This object indicates the validity and sign of the data in
        the associated instance of
        reportSampledHistoricalMeasurementValue."
    ::= { reportSampledCurrentReportsEntry 4 }


--
-- Historical Reports Table
--
reportSampledHistoricalReportsTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF ReportSampledHistoricalReportsEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "A table archiving non-active Reports for each
         defined Study up to a maximum number of Reports
         per Study."
    ::= { reportSampledMibObjects 4 }

reportSampledHistoricalReportsEntry OBJECT-TYPE
    SYNTAX      ReportSampledHistoricalReportsEntry
    MAX-ACCESS  not-accessible
    STATUS      current
```

```
    DESCRIPTION
        "A ......"
    REFERENCE
        " TBD. "
    INDEX       { reportSampledStudyIndex,
                  reportSampledHistoricalReportIndex,
                  reportSampledHistoricalMeasurementIndex }
    ::= { reportSampledHistoricalReportsTable 1 }

ReportSampledHistoricalReportsEntry ::= SEQUENCE {
    reportSampledHistoricalReportIndex        Integer32,
    reportSampledHistoricalMeasurementIndex   Integer32,
    reportSampledHistoricalMeasurementValue   Integer32,
    reportSampledHistoricalMeasurementTime    sysUpTime,
    reportSampledHistoricalMeasurementStatus  INTEGER
}

reportSampledHistoricalReportIndex OBJECT-TYPE
    SYNTAX     Integer32 (1..2147483647)
    MAX-ACCESS not-accessible
    STATUS     current
    DESCRIPTION
        "An index that uniquely identifies the particular Report
         for the specific Study."
    ::= { reportSampledHistoricalReportsEntry 1 }

reportSampledHistoricalMeasurementIndex OBJECT-TYPE
    SYNTAX     Integer32 (1..2147483647)
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
        "An index that uniquely identifies a Measurement for
         a specific Report for a Specific Study."
    ::= { reportSampledHistoriclReportsEntry 2 }

reportSampledHistoricalReportsValue OBJECT-TYPE
    SYNTAX      Integer32(1..2147483647)
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The value of the specific measurement."
    ::= { reportSampledHistoriclReportsEntry 3 }

reportSampledHistoricalMeasurementTime OBJECT-TYPE
    SYNTAX      sysUpTime
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
```

```
        "The sysUpTime of the device upon which the specific
         measurement was made."
    ::= { reportSampledHistoriclReportsEntry 5 }

reportSampledHistoricalMeasurementStatus OBJECT-TYPE
    SYNTAX      INTEGER {
        valueNotAvailable(1),
        valuePositive(2),
        valueNegative(3)
    }
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "This object indicates the validity and sign of the data in
         the associated instance of
         reportSampledHistoricalMeasurementValue."
    ::= { reportSampledHistoriclReportsEntry 5 }


--
-- Notifications
--

-- The following notification objects to define issues with making
-- and storing measurements.

-- Actions which report data, i.e., Reports, are to be handled by
-- the dismanEventMIB module.

reportSampledNotificationObjects OBJECT IDENTIFIER
                            ::= {reportSampledMibNotifications 0}
reportSampledNotificationControl OBJECT IDENTIFIER
                            ::= {reportSampledMibNotifications 1}

--
-- reportSampledNotificationObjects
--
reportSampledDataCollectionFailure NOTIFICATION-TYPE
    OBJECTS     { reportSampledStudyOwner, -- The entity that
                                           -- configured this Study
                  reportSampledStudyName,  -- The name of the Study
                                           -- that is failing to
                                           -- collect measurement data
                  reportSampledStudyOid    -- The Object ID being
                                           -- monitored in this Study
                }
    STATUS      current
    DESCRIPTION
```

```
        "reportSampledDataCollectionFailure is a notification sent
         when a ....."
    ::= { reportSampledNotificationObjects 1 }


--
-- nhdpNotificationsControl
--
reportSampledDataCollectionFailureThreshold OBJECT-TYPE
    SYNTAX      Integer32 (1..255)
    UNITS       "count"
    MAX-ACCESS  read-write
    STATUS      current
    DESCRIPTION
        "A threshold value for the number of
         consecutive measurement failures within a
         Current Report as indicated by consecutive values
         of the reportSampledCurrentMeasurementStatus being
         being set to 'valueNotAvailable(1)' which
         exceed the value of this threshold.  A value of
         '255' for this threshold indicates that the
         reportSampledDataCollectionFailure notification
         is never to be sent. "
    DEFVAL      { 10 }
    ::= { nhdpNotificationsControl 1 }


--
-- Compliance Statements
--

-- Mandatory compliance for the reportSampledMIB module will
-- include all objects defined within the module.
reportSampledCompliances  OBJECT IDENTIFIER
                          ::= { reportSampledMIBConformance 1 }
reportSampledMIBGroups    OBJECT IDENTIFIER
                          ::= { reportSampledMIBConformance 2 }

reportSampledCompliance  MODULE-COMPLIANCE
   STATUS current
   DESCRIPTION "The reportSampled basic implementation requirements
                for managed network entities that implement
                the REPORT Sampled process."
   MODULE  -- this module
   MANDATORY-GROUPS { reportSampledLocalGroup }
::= { reportSampledCompliances 1 }
```

```
--
-- Units of Conformance
--
reportSampledLocalGroup  OBJECT-GROUP
   OBJECTS {
            reportSampledStudyOwner,
            reportSampledStudyName,
            reportSampledStudyOid,
            reportSampledStudySamplingInterval,
            reportSampledStudyNumberReportMeasurements,
            reportSampledStudyMaximumNumberOfHistoricalReports,
            reportSampledStudyEntryStatus,

            reportSampledCurrentMeasurementValue,
            reportSampledCurrentMeasurementTime,
            reportSampledCurrentMeasurementStatus,

            reportSampledHistoricalMeasurementValue,
            reportSampledHistoricalMeasurementTime,
            reportSampledHistoricalMeasurementStatus,

            reportSampledDataCollectionFailure,
            reportSampledDataCollectionFailureThreshold
   }
   STATUS  current
   DESCRIPTION
      "Set of reportSampled objects to be implemented
       in this module."
::= { reportSampledMIBGroups 1 }

END
```

8. Security Considerations

(RGC Note: this section needs to be reworked.

This reportSampledMIB module defines a capability where the local device may poll other remote devices to collect performance data accessible through other MIB modules on the remote devices. These capabilities defined within the reportSampledMIB module are controllable by a network management application through SNMP. As such, a network management application could potentially use the reportSampledMIB module as a mechanism to implement a Distributed Denial-of-Service (DDoS) attack against remote devices. Care should be taken to secure access to the reportSampledMIB module agent. Specifically, access control mechanisms and authentication mechanisms (via SNMPv3) should always be used for SNMP SET operations. Further, some objects may contain data deemed sensitive and authentication and

encryption mechanisms (via SNMPv3) should be used for SNMP GET operations.

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:

- The reportSampledControlTable is a writable table whose columnar objects are read-create. The following objects with MAX ACCESS of read-create and their security sensitivities are:

-

  * usrHistoryControlBucketRequested - this object identifies the requested number of buckets (or intervals) requested for each identified object for each report instance. As such, this related to the total device memory necessary to hold the collected data for the identified reports. The device must determine whether it has the necessary storage. If not, the device can indicate the available storage through the usrHistoryControlBucketGranted object within this table. The device to protect itself against memory overruns.

  * usrHistoryControlInterval - this object identifies the time interval being sampling events. If set too low, the device may not be able to sample the object on remote devices fast enough to satisfy the requested interval. Further, setting this value too low could be used to overwhelm the processing capabilities of the remote agent, resulting in a Denial-of-Service (DoS) attack.

  * reportSampledControlRequestedNumber - this object identifies the requested number of consecutive reports of this type to be generated and stored in this device. When, the value of this object should be considered in the local device's estimates of memory consumption related to this control table row.

  * usrHistoryControlOwner - this objects provides a name associated with the presumed identity of the application configuring this report. If the local device or management applications attribute any authority to the values contained in this object, then it is critical to secure access to setting or modifying the value of this object.

  * usrHistoryControlStatus - this is the RowStatus object controlling the configuration of this table row.

- The reportSampledObjectTable is a writable table whose columnar objects are read-create. The following objects with MAX ACCESS of read-create and their security sensitivities are:

-

  * usrHistoryObjectVariable - this object identifies the specific OID on a (potentially) remote agent whose counter or gauge values are to be collected for the reports. If, for whatever reason, the values of this OID collected within the report is deemed sensitive, then the SNMP GET operations issued to collect these values should use SNMPv3 authentication and encryption mechanisms to protect.

  * reportSampledObjectIpAddrType - this object identifies the address type associated with the address of the agent whose OID data is being collected for the report.

  * reportSampledObjectIpAddress - this object identifies the address associated with the address of the agent whose OID data is being collected for the report. If the address of the remote devices is deemed sensitive, then the SNMP SETs which write or the SNMP GET which collect this information should be protected using SNMPv3 authentication and encryption mechanisms.

  * usrHistoryObjectSampleType - this object identifies the the way in which data values are to be stored within the reports.

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. Applicability Statement

(Note: this section needs to be reworked.

This document describes objects for configuring parameters of the remote report generation process on a router or close device. This MIB module, denoted reportSampledMIB module, also reports performance information and notifications. The reportSampledMIB module provides for the remote control, collection and notification of performance reports on devices. As such, it eliminates the need for periodic polling for counters from remote management stations as a means for generating performance reports. This is hoped to greatly reduce management overhead on the MANET. This sections 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.

In the following, two scenarios are listed where this MIB module is useful, i.e.,

- 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. However, to reduce polling overhead over the low bandwidth communications links, the reportSampledMIB module can be deployed the remote MANET nodes for the remote generation of performance reports.

- 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, fault and performance management are necessary for this deployment option.

10. IANA Considerations

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

Descriptor	OBJECT IDENTIFIER value
reportSampledMIB	{ experimental XXX }

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.

12. Acknowledgements

We would like to thank Bert Wijnen for pointing out the existence of the usrHistory group within RMON2 and in answering our numerous questions on the usrHistory group. Further, we wish to thank U. Herberg for promoting additions to this MIB through his thoughtful consideration of performance monitoring requirements for other MIBs within the MANET WG, e.g., NHDP and OLSR MIBs.

13. References

13.1. Normative References

[RFC2021] Waldbusser, S., "Remote Network Monitoring Management Information Base Version 2 using SMIv2", RFC 2021, January 1997.

[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.

[RFC2981] Kavasseri, R., "Event MIB", RFC 2981, October 2000.

[RFC2982] Kavasseri, R., "Distributed Management Expression MIB", RFC 2982, October 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.

13.2. 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

Changes from draft-ietf-manet-report-mib-01 to draft-ietf-manet-report-mib-02 draft.

1. Stripped the Statistical and the Historical Reports from this draft in order to greatly simplify the initial development and experiments of this MIB module.

2. Changed the RFC category to Experimental.

3. Completed the Security section.

4. Relied upon the AUGMENTS statement to simplify further this MIB definition.

Changes from draft-ietf-manet-report-mib-00 to draft-ietf-manet-report-mib-01 draft.

1. Proposed additions to the statsReports in order to potentially simplify data transmission to management applications.

2. Added some Notification definitions and their relationship to the three reports' structure, i.e., statsReports, sampledReports, and historyReports.

3. In the process of adding notifications for the Sampled and the History reports, decided to restructure the reports from their

previously rolling storage model to the fixed interval reporting used all along in the Statistics reporting. This allows the agent to notify the management application that a report has completed and that it is ready to be pulled from the agent storage.

4. Ran MIB through smilint checker and cleaned up all errors and most warnings. A few warnings remain to be addressed.

5. Cleaned up textual material.

Changes from draft-cole-manet-report-mib-02 to draft-ietf-manet-report-mib-00 draft.

1. Major change was the incorporation of the IP address objects associated with all objects of type 'OBJECT IDENTIFIER'. This allows the reportSampledMIB module to exist as a proxy report generation capability on a device separate but in close proximity to the device monitoring the referenced object.

2. Cleaned up the up front text, reducing the repetition with the object descriptions in the MIB.

3. Worked on and added sections discussing the relationship to other MIBs.

Changes from draft-cole-manet-report-mib-01 to draft-cole-manet-report-mib-02 draft.

1. Restructured the MIB somewhat to now offer the three reporting capabilities in increasing order of detail: a) statistical reports, b) sampled reports, and c) historical reports.

2. Renamed the usrHistoryGroup and elements to samplingGroup. This is in line with its actual capabilities.

3. Added a new historyGroup which provides a history of change events.

4. Updated the4 Conformance section to reflect the above changes and additions. But did not yet run smilint to check MIB syntax.

Changes from draft-cole-manet-report-mib-00 to draft-cole-manet-report-mib-01 draft.

1. Added (copied) the usrHistory group from RMON2 into the reportSampledMIB module.

2. Restructured the MIB to account for the inclusion of the reportSampledMibObjects.

3. Dropped the reportCurReportsTable as this did not make sense within the context of the reportSampledMIB module.

4. Added the Compliance and Conformance material. Defined several Compliance Groups to all for base implementations of the reportSampledMIB module for only statistical reports, for only historical reports or for both. Allow for enhanced implementations to address higher capacity issues and extension to metric reporting for statistical reporting.

5. Ran the MIB through the smilint checker and in the process corrected numerous typos, omissions, TEXTUAL CONVENTIONS, IMPORTS, etc.

6. Updated main text to reflect changes.

Appendix B. Open Issues

This section contains the set of open issues related to the development and design of the reportSampledMIB module. 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. Identify all objects requiring non-volatile storage in their DESCRIPTION clauses.

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-report-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

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

EMail: macker@itd.nrl.navy.mil

Andy Bierman
YumaWorks, Inc.
Redwood City, CA 94065

EMail: andy@yumaworks.com