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A. Bierman
K. McCloghrie
Cisco Systems, Inc.
R. Presuhn
BMC Software, Inc.

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Textual Conventions for Additional High Capacity Data Types

Status of this Memo

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Abstract

This memo specifies new textual conventions for additional high capacity data types, intended for SNMP implementations which already support the Counter64 data type. The definitions contained in this document represent a short term solution which may be deprecated in the future.

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1. The SNMP Management Framework

The SNMP Management Framework presently consists of five major components:

- An overall architecture, described in RFC 2571 [RFC2571].
- Mechanisms for describing and naming objects and events for the purpose of management. The first version of this Structure of Management Information (SMI) is called SMIv1 and described in STD 16, RFC 1155 [RFC1155], STD 16, RFC 1212 [RFC1212] and RFC 1215 [RFC1215]. The second version, called SMIv2, is described in STD 58, RFC 2578 [RFC2578], STD 58, RFC 2579 [RFC2579] and STD 58, RFC 2580 [RFC2580].
- Message protocols for transferring management information. The first version of the SNMP message protocol is called SNMPv1 and described in STD 15, RFC 1157 [RFC1157]. A second version of the SNMP message protocol, which is not an Internet standards track protocol, is called SNMPv2c and described in RFC 1901 [RFC1901] and RFC 1906 [RFC1906]. The third version of the message protocol is called SNMPv3 and described in RFC 1906 [RFC1906], RFC 2572 [RFC2572] and RFC 2574 [RFC2574].
- Protocol operations for accessing management information. The first set of protocol operations and associated PDU formats is described in STD 15, RFC 1157 [RFC1157]. A second set of protocol operations and associated PDU formats is described in RFC 1905 [RFC1905].
- A set of fundamental applications described in RFC 2573 [RFC2573] and the view-based access control mechanism described in RFC 2575 [RFC2575].

A more detailed introduction to the current SNMP Management Framework can be found in RFC 2570 [RFC2570].

Managed objects are accessed via a virtual information store, termed the Management Information Base or MIB. Objects in the MIB are defined using the mechanisms defined in the SMI.

This memo specifies a MIB module that is compliant to the SMIv2. The textual conventions defined in this MIB module cannot be translated to SMIv1 since the Counter64 type does not exist in SMIv1.

2. Overview

The Structure of Management Information [RFC2578] does not explicitly address the question of how to represent integer objects other than counters that would require up to 64 bits to provide the necessary range and precision. There are MIBs in progress targeted for the standards track, which need such data types. This memo specifies a short term solution, using textual conventions, to meet these needs.

2.1. Short Term and Long Term Objectives

There is an immediate need to provide a Gauge64 data type, similar in semantics to the Gauge32 data type, in order to support common data representations such as:

- a snapshot of a Counter64 at a given moment, e.g., history ring buffer

- the difference between two Counter64 values

There is also an immediate need for a 64-bit zero-based counter type, similar in semantics to the ZeroBasedCounter32 TC defined in the RMON-2 MIB [RFC2021].

Both of these textual conventions should use a base type of Gauge64 or Unsigned64, but such a base type is not available. Until such a base type is defined and deployed, these temporary textual conventions (which use a base type of Counter64) will be used in MIBs which require unsigned 64-bit data types.

In order to be backward compatible with existing implementations of Counter64, the ASN.1 encoding of unsigned 64-bit data types must be identical to the encoding of Counter64 objects, i.e., identified by the [APPLICATION 6] ASN.1 tag.

Note that the textual conventions defined in this document represent a limited and short-term solution to the problem. These textual conventions may be deprecated as a long term solution is defined and deployed to replace them. A MIB object which uses either of these textual conventions may also eventually have to be deprecated.

2.2. Limitations of the Textual Convention Approach

New unsigned data types with textual conventions based on the Counter64 tag, instead of a new (or other existing) ASN.1 tag have some limitations:

- The MAX-ACCESS of the TC must be read-only, because the MAX-ACCESS of the underlying Counter64 type is read-only.

- No sub-range can be specified on the TC-derived types, because sub-ranges are not allowed on Counter64 objects.

- No DEFVAL clause can be specified for the TC-derived types, because DEFVALs are not allowed on Counter64 objects.

- The TC-derived types cannot be used in an INDEX clause, because there is no INDEX clause mapping defined for objects of type Counter64.

3. New Textual Conventions

The following textual conventions are defined to support unsigned 64-bit data types.

3.1. CounterBasedGauge64

This textual convention defines a 64-bit gauge, but defined with Counter64 syntax, since no Gauge64 or Unsigned64 base type is available in SMIv2.

This TC is used for storing the difference between two Counter64 values, or simply storing a snapshot of a Counter64 value at a given moment in time.

3.2. ZeroBasedCounter64

This textual convention defines a 64-bit counter with an initial value of zero, instead of an arbitrary initial value.

This TC is used for counter objects in tables which are instantiated by management application action.

4. Definitions

```
HCNUM-TC DEFINITIONS ::= BEGIN

IMPORTS
  MODULE-IDENTITY, mib-2, Counter64
      FROM SNMPv2-SMI
  TEXTUAL-CONVENTION
      FROM SNMPv2-TC;

hcnumTC MODULE-IDENTITY
  LAST-UPDATED "200006080000Z"
```

```
     ORGANIZATION "IETF OPS Area"
     CONTACT-INFO
           "       E-mail: mibs@ops.ietf.org
                   Subscribe: majordomo@psg.com
                     with msg body: subscribe mibs

                   Andy Bierman
                   Cisco Systems Inc.
                   170 West Tasman Drive
                   San Jose, CA 95134 USA
                   +1 408-527-3711
                   abierman@cisco.com

                   Keith McCloghrie
                   Cisco Systems Inc.
                   170 West Tasman Drive
                   San Jose, CA 95134 USA
                   +1 408-526-5260
                   kzm@cisco.com

                   Randy Presuhn
                   BMC Software, Inc.
                   Office 1-3141
                   2141 North First Street
                   San Jose,  California 95131 USA
                   +1 408 546-1006
                   rpresuhn@bmc.com"
     DESCRIPTION
           "A MIB module containing textual conventions
            for high capacity data types. This module
            addresses an immediate need for data types not directly
            supported in the SMIv2. This short-term solution
            is meant to be deprecated as a long-term solution
            is deployed."
     REVISION        "200006080000Z"
     DESCRIPTION
           "Initial Version of the High Capacity Numbers
            MIB module, published as RFC 2856."
     ::= { mib-2 78 }

   CounterBasedGauge64 ::= TEXTUAL-CONVENTION
     STATUS       current
     DESCRIPTION
           "The CounterBasedGauge64 type represents a non-negative
           integer, which may increase or decrease, but shall never
           exceed a maximum value, nor fall below a minimum value. The
           maximum value can not be greater than 2^64-1
           (18446744073709551615 decimal), and the minimum value can
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```
            not be smaller than 0.  The value of a CounterBasedGauge64
            has its maximum value whenever the information being modeled
            is greater than or equal to its maximum value, and has its
            minimum value whenever the information being modeled is
            smaller than or equal to its minimum value.  If the
            information being modeled subsequently decreases below
            (increases above) the maximum (minimum) value, the
            CounterBasedGauge64 also decreases (increases).

            Note that this TC is not strictly supported in SMIv2,
            because the 'always increasing' and 'counter wrap' semantics
            associated with the Counter64 base type are not preserved.
            It is possible that management applications which rely
            solely upon the (Counter64) ASN.1 tag to determine object
            semantics will mistakenly operate upon objects of this type
            as they would for Counter64 objects.

            This textual convention represents a limited and short-term
            solution, and may be deprecated as a long term solution is
            defined and deployed to replace it."
        SYNTAX Counter64


    ZeroBasedCounter64 ::= TEXTUAL-CONVENTION
        STATUS current
        DESCRIPTION
            "This TC describes an object which counts events with the
            following semantics: objects of this type will be set to
            zero(0) on creation and will thereafter count appropriate
            events, wrapping back to zero(0) when the value 2^64 is
            reached.

            Provided that an application discovers the new object within
            the minimum time to wrap it can use the initial value as a
            delta since it last polled the table of which this object is
            part.  It is important for a management station to be aware
            of this minimum time and the actual time between polls, and
            to discard data if the actual time is too long or there is
            no defined minimum time.

            Typically this TC is used in tables where the INDEX space is
            constantly changing and/or the TimeFilter mechanism is in
            use.

            Note that this textual convention does not retain all the
            semantics of the Counter64 base type. Specifically, a
            Counter64 has an arbitrary initial value, but objects
            defined with this TC are required to start at the value
```

```
            zero.  This behavior is not likely to have any adverse
            effects on management applications which are expecting
            Counter64 semantics.

            This textual convention represents a limited and short-term
            solution, and may be deprecated as a long term solution is
            defined and deployed to replace it."
        SYNTAX Counter64

    END
```

5. Intellectual Property

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6. References

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7. Security Considerations

This module does not define any management objects. Instead, it defines a set of textual conventions which may be used by other MIB modules to define management objects.

Meaningful security considerations can only be written in the modules that define management objects.

8. Authors' Addresses

Andy Bierman
Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134 USA

Phone: +1 408-527-3711
EMail: abierman@cisco.com

Keith McCloghrie
Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134 USA

Phone: +1 408-526-5260
EMail: kzm@cisco.com

Randy Presuhn
BMC Software, Inc.
Office 1-3141
2141 North First Street
San Jose, California 95131 USA

Phone: +1 408 546-1006
EMail: rpresuhn@bmc.com

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