

Network Working Group  
Request for Comments: 2856  
Category: Standards Track

A. Bierman  
K. McCloghrie  
Cisco Systems, Inc.  
R. Presuhn  
BMC Software, Inc.  
June 2000

## Textual Conventions for Additional High Capacity Data Types

### Status of this Memo

This document specifies an Internet standards track protocol for the Internet community, and requests discussion and suggestions for improvements. Please refer to the current edition of the "Internet Official Protocol Standards" (STD 1) for the standardization state and status of this protocol. Distribution of this memo is unlimited.

### Copyright Notice

Copyright (C) The Internet Society (2000). All Rights Reserved.

### 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.

### Table of Contents

1 The SNMP Management Framework .....	2
2 Overview .....	3
2.1 Short Term and Long Term Objectives .....	3
2.2 Limitations of the Textual Convention Approach .....	3
3 New Textual Conventions .....	4
3.1 CounterBasedGauge64 .....	4
3.2 ZeroBasedCounter64 .....	4
4 Definitions .....	4
5 Intellectual Property .....	7
6 References .....	7
7 Security Considerations .....	9
8 Authors' Addresses .....	9
9 Full Copyright Statement .....	10

## 1. The SNMP Management Framework

The SNMP Management Framework presently consists of five major components:

- o An overall architecture, described in RFC 2571 [RFC2571].
- o 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].
- o 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].
- o 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].
- o 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

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

The IETF takes no position regarding the validity or scope of any intellectual property or other rights that might be claimed to pertain to the implementation or use of the technology described in this document or the extent to which any license under such rights might or might not be available; neither does it represent that it has made any effort to identify any such rights. Information on the IETF's procedures with respect to rights in standards-track and standards-related documentation can be found in BCP-11. Copies of claims of rights made available for publication and any assurances of licenses to be made available, or the result of an attempt made to obtain a general license or permission for the use of such proprietary rights by implementors or users of this specification can be obtained from the IETF Secretariat.

The IETF invites any interested party to bring to its attention any copyrights, patents or patent applications, or other proprietary rights which may cover technology that may be required to practice this standard. Please address the information to the IETF Executive Director.

## 6. References

- [RFC1155] Rose, M. and K. McCloghrie, "Structure and Identification of Management Information for TCP/IP-based Internets", STD 16, RFC 1155, May 1990.
- [RFC1157] Case, J., Fedor, M., Schoffstall, M. and J. Davin, "Simple Network Management Protocol", STD 15, RFC 1157, May 1990.
- [RFC1212] Rose, M. and K. McCloghrie, "Concise MIB Definitions", STD 16, RFC 1212, March 1991.
- [RFC1215] Rose, M., "A Convention for Defining Traps for use with the SNMP", RFC 1215, March 1991.

- [RFC1901] Case, J., McCloghrie, K., Rose, M. and S. Waldbusser, "Introduction to Community-based SNMPv2", RFC 1901, January 1996.
- [RFC1905] Case, J., McCloghrie, K., Rose, M. and S. Waldbusser, "Protocol Operations for Version 2 of the Simple Network Management Protocol (SNMPv2)", RFC 1905, January 1996.
- [RFC1906] Case, J., McCloghrie, K., Rose, M. and S. Waldbusser, "Transport Mappings for Version 2 of the Simple Network Management Protocol (SNMPv2)", RFC 1906, January 1996.
- [RFC2021] Waldbusser, S., "Remote Network Monitoring MIB (RMON-2)", RFC 2021, January 1997.
- [RFC2026] Bradner, S., "The Internet Standards Process -- Revision 3", BCP 9, RFC 2026, October 1996.
- [RFC2570] Case, J., Mundy, R., Partain, D. and B. Stewart, "Introduction to Version 3 of the Internet-standard Network Management Framework", RFC 2570, April 1999.
- [RFC2571] Harrington, D., Presuhn, R. and B. Wijnen, "An Architecture for Describing SNMP Management Frameworks", RFC 2571, April 1999.
- [RFC2572] Case, J., Harrington D., Presuhn R. and B. Wijnen, "Message Processing and Dispatching for the Simple Network Management Protocol (SNMP)", RFC 2572, April 1999.
- [RFC2573] Levi, D., Meyer, P. and B. Stewart, "SNMPv3 Applications", RFC 2573, April 1999.
- [RFC2574] Blumenthal, U. and B. Wijnen, "User-based Security Model (USM) for version 3 of the Simple Network Management Protocol (SNMPv3)", RFC 2574, April 1999.
- [RFC2575] Wijnen, B., Presuhn, R. and K. McCloghrie, "View-based Access Control Model (VACM) for the Simple Network Management Protocol (SNMP)", RFC 2575, April 1999.
- [RFC2578] McCloghrie, K., Perkins, D., Schoenwaelder, J., Case, J., Rose, M. and S. Waldbusser, "Structure of Management Information Version 2 (SMIv2)", STD 58, RFC 2578, April 1999.



[RFC2579] McCloghrie, K., Perkins, D., Schoenwaelder, J., Case, J., Rose, M. and S. Waldbusser, "Textual Conventions for SMIV2", STD 58, RFC 2579, April 1999.

[RFC2580] McCloghrie, K., Perkins, D., Schoenwaelder, J., Case, J., Rose, M. and S. Waldbusser, "Conformance Statements for SMIV2", STD 58, RFC 2580, April 1999.

## 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](mailto: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](mailto: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](mailto:rpresuhn@bmc.com)

## 9. Full Copyright Statement

Copyright (C) The Internet Society (2000). All Rights Reserved.

This document and translations of it may be copied and furnished to others, and derivative works that comment on or otherwise explain it or assist in its implementation may be prepared, copied, published and distributed, in whole or in part, without restriction of any kind, provided that the above copyright notice and this paragraph are included on all such copies and derivative works. However, this document itself may not be modified in any way, such as by removing the copyright notice or references to the Internet Society or other Internet organizations, except as needed for the purpose of developing Internet standards in which case the procedures for copyrights defined in the Internet Standards process must be followed, or as required to translate it into languages other than English.

The limited permissions granted above are perpetual and will not be revoked by the Internet Society or its successors or assigns.

This document and the information contained herein is provided on an "AS IS" basis and THE INTERNET SOCIETY AND THE INTERNET ENGINEERING TASK FORCE DISCLAIMS ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY WARRANTY THAT THE USE OF THE INFORMATION HEREIN WILL NOT INFRINGE ANY RIGHTS OR ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

## Acknowledgement

Funding for the RFC Editor function is currently provided by the Internet Society.

