Definitions of Managed Objects for Packet Sampling
<draft-ietf-ipfix-psamp-mib-06.txt>

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 extensions to the IPFIX SELECTOR MIB module. For IPFIX implementations that use packet Sampling (PSAMP) techniques, this memo defines the PSAMP MIB module containing managed objects for providing information on applied packet selection functions and their parameters.

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1. 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].

2. Introduction

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

This document is a product of the IP Flow Information eXport (IPFIX) working group. Work on this document was started in the Packet Sampling (PSAMP) Working Group (WG) and moved to the IPFIX WG when the PSAMP WG was concluded.

Its purpose is to define managed objects for monitoring PSAMP Devices performing packet selection by Sampling and Filtering as described in [RFC5475].

It is assumed that packet Sampling is performed according to the framework defined in [RFC5474].

Managed objects in the PSAMP MIB module are defined as an extension of the IPFIX MIB and IPFIX SELECTOR MIB modules [RFC6615]. Since the IPFIX MIB module is only for monitoring the same holds true for the PSAMP MIB module defined in this document. The definition of objects is in line with the PSAMP information model [RFC5477].

Section 3 gives an overview of the PSAMP documents, while section 4 refers to the related IPFIX documents. Section 5 describes the structure of the PSAMP MIB module and section 6 contains the formal definition. Security issues are discussed in section 7.
3. PSAMP Documents Overview

[RFC5474]: "A Framework for Packet Selection and Reporting" describes the PSAMP framework for network elements to select subsets of packets by statistical and other methods, and to export a stream of reports on the selected packets to a Collector.

[RFC5475]: "Sampling and Filtering Techniques for IP Packet Selection" describes the set of packet selection techniques supported by PSAMP.


[RFC5477]: "Information Model for Packet Sampling Exports" defines an information and data model for PSAMP.

This document: "Definitions of Managed Objects for Packet Sampling" describes the PSAMP Management Information Base.

4. Related IPFIX Documents

The IPFIX protocol provides network administrators with access to IP Flow information.

[RFC5101]: The protocol document "Specification of the IP Flow Information Export (IPFIX) Protocol for the Exchange of IP Traffic Flow Information" specifies how IPFIX Data Records and Templates are carried via a congestion-aware transport protocol from IPFIX Exporting Processes to IPFIX Collecting Processes. It also specifies the data types used in the PSAMP MIB module and their encoding.

[RFC6615]: The IPFIX MIB "Definitions of Managed Objects for IP Flow Information Export" is the basis for this document because it extends the IPFIX SELECTOR MIB module defined there.

5. Structure of the PSAMP MIB module

The IPFIX MIB module defined in [RFC6615] has the concept of a packet Selection Process containing a set of Selector function instances. Selection Processes and functions are referenced in the `ipfixSelectionProcessTable` of the IPFIX MIB module. The `ipfixSelectionProcessTable` identifies an instance of a Selector function by an OID. The OID points to an object that describes the Selector function. For simple Selector functions without parameters,
the OID refers to an object which contains only one additional object indicating the current availability of the function. For functions which have one or more parameters the object has a subtree that in addition to an availability object contains a table with a conceptual column for each parameter. Entries (conceptual rows) in this table represent different combinations of parameter values for instances of the Selector function.

The object ipfixSelectorFunctions in the IPFIX SELECTOR MIB module serves as the root for objects that describe instances of packet Selector functions. The IPFIX SELECTOR MIB module is a very small module which is defined in [RFC6615]. The top level OIDs of the parameter trees located beneath ipfixSelectorFunctions are maintained by IANA. In the IPFIX SELECTOR MIB module as defined by [RFC6615] the object ipfixSelectorFunctions contains just a single trivial packet Selector function called ipfixFuncSelectAll that selects every packet and has no parameter:

ipfixSelectorMIB
   +- ipfixSelectorObjects(1)
      +- ipfixSelectorFunctions(1)
         +- ipfixFuncSelectAll(1)
            +- ipfixFuncSelectAllAvail(1)

The PSAMP MIB module defined in this document registers additional toplevel OIDs for the parameter subtrees of its Selector functions in the IPFIX-SELECTOR-MIB Function subregistry according to the procedures defined in [RFC6615]. It introduces six new subtrees beneath ipfixSelectorFunctions. Each of them describes a packet Selector function with one or more parameters. Naming and ordering of objects is fully in line with the guidelines given in section 6.1 of [RFC6615]. All functions and their parameters are already listed in the overview of functions given by the table in section 8.2.1 of [RFC5477].

5.1. Textual Conventions

The PSAMP MIB module imports two textual conventions which define data types used in this MIB module from other MIB modules. The Unsigned64TC data type is imported from the APPLICATION MIB module [RFC2564] and the Float64TC data type is imported from the FLOAT-TC-MIB module [RFC6340]. Those data types are defined according to [RFC5101]. Those data types are not an integral part of [RFC2578] but are needed to define objects in this MIB module that conform to the Information Elements defined for those objects in [RFC5477].

The Unsigned64TC textual convention describes an unsigned integer of 64 bits. It is imported from the APPLICATION MIB module. The
Float64TC textual convention describes the format that is used for 64 bit floating point numbers.

5.2. Packet Selection Functions

In general, different packet Selector functions have different parameters. The PSAMP MIB module contains six objects with subtrees that provide information on parameters of function instances of different Selector functions. All objects are named and structured according to section 8.2.1 of [RFC5477]:

```
ipfixSelectorFunctions(1)
  +-- psampSampCountBased(2)
  +-- psampSampTimeBased(3)
  +-- psampSampRandOutOfN(4)
  +-- psampSampUniProb(5)
  +-- psampFiltPropMatch(6)
  +-- psampFiltHash(7)
```

Indexing of these functions in the PSAMP MIB module starts with index (2). The function ipfixFuncSelectAll with index (1) is already defined in the IPFIX SELECTOR MIB module as shown above.

The object tree for each of these functions is described below. Semantics of all functions and their parameters are described in detail in [RFC5475]. More information on the Selector Reports can also be found in section 6.5.2 of [RFC5476].

5.2.1. Systematic Count-based Sampling

The first Selector function is systematic count-based Sampling. Its availability is indicated by object psampSampCountBasedAvail. The function has two parameters: psampSampCountBasedInterval and psampSampCountBasedSpace. Different combination of values of these parameters for different instances of the Selector function are represented by different conceptual rows in table psampSampCountBasedParamSetEntry:

```
psampSampCountBased(2)
  +-- psampSampCountBasedAvail(1)
  +-- psampSampCountBasedParamSetTable(2)
    +-- psampSampCountBasedParamSetEntry(1) [psampSampCountBasedIndex]
      +-- psampSampCountBasedIndex(1)
      +-- psampSampCountBasedInterval(2)
      +-- psampSampCountBasedSpace(3)
```
5.2.2. Systematic Time-based Sampling

The second Selector function is systematic time-based Sampling. The structure of the sub-tree for this function is similar to the psampSampCountBased sub-tree. Parameters are psampSampTimeBasedInterval and psampSampTimeBasedSpace. They appear to be the same as for count based Sampling, but their data types are different because they indicate time values instead of numbers of packets:

psampSampTimeBased(3)
  +-- psampSampTimeBasedAvail(1)
  +-- psampSampTimeBasedParamSetTable(2)
    +-- psampSampTimeBasedParamSetEntry(1) [psampSampTimeBasedIndex]
      +-- psampSampTimeBasedIndex(1)
      +-- psampSampTimeBasedInterval(2)
      +-- psampSampTimeBasedSpace(3)

5.2.3. Random n-out-of-N Sampling

The third Selector function is random n-out-of-N Sampling. Parameters are psampSampRandOutOfNSize and psampSampRandOutOfNPopulation:

psampSampRandOutOfN(4)
  +-- psampSampRandOutOfNAvail(1)
  +-- psampSampRandOutOfNParamSetTable(2)
    +-- psampSampRandOutOfNParamSetEntry(1) [psampSampRandOutOfNIndex]
      +-- psampSampRandOutOfNIndex(1)
      +-- psampSampRandOutOfNSize(2)
      +-- psampSampRandOutOfNPopulation(3)

5.2.4. Uniform Probabilistic Sampling

The fourth Selector function is uniform probabilistic Sampling. It has just a single parameter called psampSampUniProbProbability:

psampSampUniProb(5)
  +-- psampSampUniProbAvail(1)
  +-- psampSampUniProbParamSetTable(2)
    +-- psampSampUniProbParamSetEntry(1) [psampSampUniProbIndex]
      +-- psampSampUniProbIndex(1)
      +-- psampSampUniProbProbability(2)
5.2.5. Property Match Filtering

The fifth Selector function is property match Filtering. For this Selector function there is a broad variety of possible parameters that could be used. But as stated in section 8.2.1 of [RFC5477] there are no agreed parameters specified and the sub-tree for this function only contains an object indicating the availability of this function. Parameters cannot be retrieved via the PSAMP MIB module:

```
psampFiltPropMatch(6)
   +-- psampFiltPropMatchAvail(1)
```

5.2.6. Hash-based Filtering

The sixth Selector function is hash-based Filtering. The object psampFiltHashFunction is an enumeration that specifies the kind of hash function that is applied. These hash function have quite a number of parameters and the actual number may vary with the choice of the hash function applied. The common parameter set for all hash-based Filtering functions contains 7 parameters: psampFiltHashInitializerValue, psampFiltHashIpPayloadOffset, psampFiltHashIpPayloadSize, psampFiltHashSelectedRangeMin, psampFiltHashSelectedRangeMax, psampFiltHashOutputRangeMin, and psampFiltHashOutputRangeMax.

```
psampFiltHash(7)
   +-- psampFiltHashAvail(1)
   +-- psampFiltHashCapabilities(2)
   +-- psampFiltHashParamSetTable(3)
      +-- psampFiltHashParamSetEntry(1) [psampFiltHashIndex]
         +-- psampFiltHashIndex(1)
         +-- psampFiltHashFunction(2)
         +-- psampFiltHashInitializerValue(3)
         +-- psampFiltHashIpPayloadOffset(4)
         +-- psampFiltHashIpPayloadSize(5)
         +-- psampFiltHashSelectedRangeMin(6)
         +-- psampFiltHashSelectedRangeMax(7)
         +-- psampFiltHashOutputRangeMin(8)
         +-- psampFiltHashOutputRangeMax(9)
```

Further parameters depend on the applied hash function and are not specified within the PSAMP MIB module.

6. Definitions

```
PSAMP-MIB DEFINITIONS ::= BEGIN
```

Dietz, et al. draft-ietf-ipfix-psamp-mib-06.txt [Page 8]
IMPORTS

MODULE-IDENTITY, OBJECT-TYPE, Integer32, Unsigned32, mib-2
FROM SNMPv2-SMI -- RFC2578
TruthValue
FROM SNMPv2-TC -- RFC2579
MODULE-COMPLIANCE, OBJECT-GROUP
FROM SNMPv2-CONF -- RFC2580
Unsigned64TC
FROM APPLICATION-MIB -- RFC2564
Float64TC
FROM FLOAT-TC-MIB -- RFC6340
ipfixSelectorFunctions
FROM IPFIX-SELECTOR-MIB; -- RFC6615

psampMIB MODULE-IDENTITY
LAST-UPDATED "201207051200Z" -- 05 July 2012
ORGANIZATION "IETF IPFIX Working Group"
CONTACT-INFO
"WG charter:

Mailing Lists:
General Discussion: ipfix@ietf.org
To Subscribe: http://www1.ietf.org/mailman/listinfo/ipfix
Archive:
http://www1.ietf.org/mail-archive/web/ipfix/current/index.html

Editor:
Thomas Dietz
NEC Europe Ltd.
NEC Laboratories Europe
Network Research Division
Kurfuersten-Anlage 36
69115 Heidelberg
Germany
Phone: +49 6221 4342-128
Email: Thomas.Dietz@neclab.eu

Benoit Claise
Cisco Systems, Inc.
De Kleetlaan 6a b1
Degem 1831
Belgium
Phone: +32 2 704 5622
Email: bclaise@cisco.com

Juergen Quittek
NEC Europe Ltd.
DESCRIPTION
"The PSAMP MIB defines managed objects for packet sampling and filtering.
These objects provide information about managed nodes supporting packet sampling, including packet sampling capabilities, configuration and statistics.
The PSAMP MIB module registers additional toplevel OIDs for the parameter subtrees of its Selector functions in the IPFIX-SELECTOR-MIB Function subregistry according to the procedures defined in RFC 6615.

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-- RFC Ed.: replace yyyy with actual RFC number & remove this notice
-- Revision history

REVISION "201207051200Z" -- 05 July 2012
DESCRIPTION
"Initial version, published as RFC yyyy."
-- RFC Ed.: replace yyyy with actual RFC number & remove this notice
::= { mib-2 xxx }
-- RFC Ed.: replace xxx which is to be assigned by IANA & remove -- this notice.

-- Top level structure of the MIB
psampObjects OBJECT IDENTIFIER ::= { psampMIB 1 }
psampConformance OBJECT IDENTIFIER ::= { psampMIB 2 }

--==================================================================
-- Packet selection sampling methods group of objects
--==================================================================

--*= Method 1: Systematic count-based Sampling
--==================================================================
psampSampCountBasedAvail OBJECT-TYPE
SYNTAX      TruthValue
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
 "This object indicates the availability of systematic
count-based sampling at the managed node.

A Selector may be unavailable if it is implemented but
currently disabled due to e.g., administrative reasons, lack
of resources or similar."
::= { psampSampCountBased 1 }

psampSampCountBasedParamSetTable OBJECT-TYPE
SYNTAX      SEQUENCE OF
          PsampSampCountBasedParamSetEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
 "This table lists configurations of systematic count-based
packet sampling. A parameter set describing a
configuration contains two parameters: the sampling
interval length and space."
::= { psampSampCountBased 2 }

PsampSampCountBasedParamSetEntry OBJECT-TYPE
SYNTAX      PsampSampCountBasedParamSetEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
 "Defines an entry in the psampSampCountBasedParamSetTable."
INDEX { psampSampCountBasedIndex }
::= { psampSampCountBasedParamSetTable 1 }

PsampSampCountBasedParamSetEntry ::= SEQUENCE {
  psampSampCountBasedIndex     Integer32,
  psampSampCountBasedInterval  Unsigned32,
  psampSampCountBasedSpace     Unsigned32
}
psampSampCountBasedIndex OBJECT-TYPE
SYNTAX Integer32 (1..2147483647)
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION "The index of this parameter set in the psampSampCountBasedParamSetTable. It is used in the object ipfixSelectionProcessSelectorFunction entries of the ipfixSelectionProcessTable in the IPFIX-MIB as reference to this parameter set."
::= { psampSampCountBasedParamSetEntry 1 }

psampSampCountBasedInterval OBJECT-TYPE
SYNTAX Unsigned32
UNITS "packets"
MAX-ACCESS read-only
STATUS current
DESCRIPTION "This object specifies the number of packets that are consecutively sampled. A value of 100 means that 100 consecutive packets are sampled."
REFERENCE "RFC5475, Section 5.1 and RFC5477, Section 8.2"
::= { psampSampCountBasedParamSetEntry 2 }

psampSampCountBasedSpace OBJECT-TYPE
SYNTAX Unsigned32
UNITS "packets"
MAX-ACCESS read-only
STATUS current
DESCRIPTION "This object specifies the number of packets between two psampSampCountBasedInterval’s. A value of 100 means that the next interval starts 100 packets (which are not sampled) after the current psampSampCountBasedInterval is over."
REFERENCE "RFC5475, Section 5.1 and RFC5477, Section 8.2"
::= { psampSampCountBasedParamSetEntry 3 }

--==================================================================
--* Method 2: Systematic time-based Sampling
--==================================================================

-- Reference: RFC5475, Section 5.1, RFC5476 Section 6.5.2.2 and -- RFC5477, Section 8.2
psampSampTimeBased OBJECT IDENTIFIER
::= { ipfixSelectorFunctions 3 }
psampSampTimeBasedAvail OBJECT-TYPE
SYNTAX      TruthValue
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
"This object indicates the availability of systematic
time-based sampling at the managed node.
A Selector may be unavailable if it is implemented but
currently disabled due to e.g., administrative reasons, lack
of resources or similar."
::= { psampSampTimeBased 1 }

-- Parameter Set Table ++++++++++++++++++++++++++++++++++++++++++++++

psampSampTimeBasedParamSetTable OBJECT-TYPE
SYNTAX      SEQUENCE OF
            PsampSampTimeBasedParamSetEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
"This table lists configurations of systematic time-based
packet sampling. A parameter set describing a configuration
contains two parameters: the sampling interval length and
the space."
::= { psampSampTimeBasedParamSetTable 1 }

PsampSampTimeBasedParamSetEntry ::= SEQUENCE {
    psampSampTimeBasedIndex     Integer32,
    psampSampTimeBasedInterval  Unsigned32,
    psampSampTimeBasedSpace     Unsigned32
}

psampSampTimeBasedIndex OBJECT-TYPE
SYNTAX      Integer32 (1..2147483647)
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION

"The index of this parameter set in the
psampSampTimeBasedParamSetTable. It is used in the
object ipfixSelectionProcessSelectorFunction entries of
the ipfixSelectionProcessTable in the IPFIX-MIB as reference
to this parameter set."
::= { psampSampTimeBasedParamSetEntry 1 }

psampSampTimeBasedInterval OBJECT-TYPE
SYNTAX Unsigned32
UNITS "microseconds"
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"This object specifies the time interval in microseconds
during which all arriving packets are sampled."
REFERENCE
"RFC5475, Section 5.1 and RFC5477, Section 8.2"
::= { psampSampTimeBasedParamSetEntry 2 }

psampSampTimeBasedSpace OBJECT-TYPE
SYNTAX Unsigned32
UNITS "microseconds"
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"This object specifies the time interval in microseconds
between two psampSampTimeBasedInterval's. A value of 100
means that the next interval starts 100 microseconds (during
which no packets are sampled) after the current
psampSampTimeBasedInterval is over."
REFERENCE
"RFC5475, Section 5.1 and RFC5477, Section 8.2"
::= { psampSampTimeBasedParamSetEntry 3 }

--==================================================================
--* Method 3: Random n-out-of-N Sampling
--==================================================================

-- Reference: RFC5475, Section 5.2.1, RFC5476 Section 6.5.2.3 and
-- RFC5477, Section 8.2

psampSampRandOutOfN OBJECT IDENTIFIER
::= { ipfixSelectorFunctions 4 }

psampSampRandOutOfNAvail OBJECT-TYPE
SYNTAX TruthValue
MAX-ACCESS read-only
STATUS current
DESCRIPTION
This object indicates the availability of random n-out-of-N sampling at the managed node.

A Selector may be unavailable if it is implemented but currently disabled due to e.g., administrative reasons, lack of resources or similar.

 ::= { psampSampRandOutOfN 1 }

-- Parameter Set Table ++++++++++++++++++++++++++++++++++++++++++++++

psampSampRandOutOfNPParamSetTable OBJECT-TYPE
SYNTAX    SEQUENCE OF
PsampSampRandOutOfNPParamSetEntry
MAX-ACCESS not-accessible
STATUS    current
DESCRIPTION
"This table lists configurations of random n-out-of-N sampling. A parameter set describing a configuration contains two parameters, the sampling size and the parent population."
 ::= { psampSampRandOutOfN 2 }

psampSampRandOutOfNPParamSetEntry OBJECT-TYPE
SYNTAX    PsampSampRandOutOfNPParamSetEntry
MAX-ACCESS not-accessible
STATUS    current
DESCRIPTION
"Defines an entry in the psampSampRandOutOfNPParamSetTable."
INDEX { psampSampRandOutOfNIndex }
 ::= { psampSampRandOutOfNPParamSetTable 1 }

PsampSampRandOutOfNPParamSetEntry ::= 
SEQUENCE {
    psampSampRandOutOfNIndex        Integer32,
    psampSampRandOutOfNSize         Unsigned32,
    psampSampRandOutOfNPopulation   Unsigned32
}

psampSampRandOutOfNIndex OBJECT-TYPE
SYNTAX    Integer32 (1..2147483647)
MAX-ACCESS not-accessible
STATUS    current
DESCRIPTION
"The index of this parameter set in the psampSampRandOutOfNPParamSetTable. It is used in the object ipfixSelectionProcessSelectorFunction entries of the ipfixSelectionProcessTable in the IPFIX-MIB as reference to this parameter set."
::= { psampSampRandOutOfNParamSetEntry 1 }

psampSampRandOutOfNSize OBJECT-TYPE
SYNTAX      Unsigned32
UNITS       "packets"
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION  "This object specifies the number of elements taken from the parent Population specified in psampSampRandOutOfNPopulation."
REFERENCE   "RFC5475, Section 5.2.1 and RFC5477, Section 8.2"
::= { psampSampRandOutOfNParamSetEntry 2 }

psampSampRandOutOfNPopulation OBJECT-TYPE
SYNTAX      Unsigned32
UNITS       "packets"
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION  "This object specifies the number of elements in the parent Population."
REFERENCE   "RFC5475, Section 5.2.1 and RFC5477, Section 8.2"
::= { psampSampRandOutOfNParamSetEntry 3 }

--==================================================================
--* Method 4: Uniform probabilistic Sampling
--==================================================================

-- Reference: RFC5475, Section 5.2.2, RFC5476 Section 6.5.2.4 and -- RFC5477, Section 8.2

psampSampUniProb OBJECT IDENTIFIER ::= { ipfixSelectorFunctions 5 }

psampSampUniProbAvail OBJECT-TYPE
SYNTAX      TruthValue
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION  "This object indicates the availability of random uniform probabilistic sampling at the managed node.

A Selector may be unavailable if it is implemented but currently disabled due to e.g., administrative reasons, lack of resources or similar."
::= { psampSampUniProb 1 }
-- Reference: RFC5475, Section 5.2.2.1 and RFC5477, Section 8.2

psampSampUniProbParamSetTable OBJECT-TYPE
SYNTAX      SEQUENCE OF
PsampSampUniProbParamSetEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
"This table lists configurations of random probabilistic
sampling. A parameter set describing a configuration
contains a single parameter only: the sampling probability."
::= { psampSampUniProb 2 }

PsampSampUniProbParamSetEntry OBJECT-TYPE
SYNTAX      PsampSampUniProbParamSetEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
"Defines an entry in the psampSampUniProbParamSetTable."
INDEX { psampSampUniProbIndex }
::= { psampSampUniProbParamSetTable 1 }

PsampSampUniProbParamSetEntry ::= SEQUENCE {
    psampSampUniProbIndex       Integer32,
    psampSampUniProbProbability Float64TC
}

psampSampUniProbIndex OBJECT-TYPE
SYNTAX      Integer32 (1..2147483647)
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
"The index of this parameter set in the
psampSampUniProbParamSetTable. It is used in the
object ipfixSelectionProcessSelectorFunction entries of
the ipfixSelectionProcessTable in the IPFIX-MIB as reference
to this parameter set."
::= { psampSampUniProbParamSetEntry 1 }

psampSampUniProbProbability OBJECT-TYPE
SYNTAX      Float64TC
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
"This object specifies the probability that a packet is
sampled, expressed as a value between 0 and 1. The
probability is equal for every packet. A value of 0 means no packet is sampled since the probability is 0. A value of 1 means all packets are sampled since the probability is 1. NaN (not a number) and infinity MUST NOT be used."

REFERENCE
"RFC5475, Section 5.2.2.1 and RFC5477, Section 8.2"
::= { psampSampUniProbParamSetEntry 2 }

--==================================================================
-- Packet selection filtering methods group of objects
--==================================================================

--==================================================================
--* Method 5: Property Match filtering
--==================================================================

-- Reserves Method 5 (see RFC5475, Section 6.1, RFC5476
-- Section 6.5.2.5 and RFC5477)
psampFiltPropMatch OBJECT IDENTIFIER ::= { ipfixSelectorFunctions 6 }

psampFiltPropMatchAvail OBJECT-TYPE
SYNTAX      TruthValue
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
"This object indicates the availability of property match filtering at the managed node.

A Selector may be unavailable if it is implemented but currently disabled due to e.g., administrative reasons, lack of resources or similar."
::= { psampFiltPropMatch 1 }

--==================================================================
--* Method 6: Hash filtering
--==================================================================

-- Reference: RFC5475, Section 6.2, RFC5476 Section 6.5.2.6 and
-- RFC5477, Section 8.3
psampFiltHash OBJECT IDENTIFIER ::= { ipfixSelectorFunctions 7 }

psampFiltHashAvail OBJECT-TYPE
SYNTAX      TruthValue
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
"This object indicates the availability of hash filtering at the managed node.

A Selector may be unavailable if it is implemented but currently disabled due to e.g., administrative reasons, lack of resources or similar."

::= { psampFiltHash 1 }

psampFiltHashCapabilities OBJECT IDENTIFIER
::= { psampFiltHash 2 }

-- Parameter Set Table +++++++++++++++++++++++++++++++++++++++++++++
-- Reference: RFC5475, Sections 6.2, 3.8, and 7.1
psampFiltHashParamSetTable OBJECT-TYPE
SYNTAX      SEQUENCE OF
             PsampFiltHashParamSetEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
 "This table lists configurations of hash filtering. A parameter set describing a configuration contains eight parameters describing the hash function."
::= { psampFiltHash 3 }

psampFiltHashParamSetEntry OBJECT-TYPE
SYNTAX      PsampFiltHashParamSetEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
 "Defines an entry in the psampFiltHashParamSetTable."
INDEX { psampFiltHashIndex }
::= { psampFiltHashParamSetTable 1 }

PsampFiltHashParamSetEntry ::= SEQUENCE {
    psampFiltHashIndex            Integer32,
    psampFiltHashFunction         INTEGER,
    psampFiltHashInitializerValue Unsigned64TC,
    psampFiltHashIpPayloadOffset  Unsigned64TC,
    psampFiltHashIpPayloadSize    Unsigned64TC,
    psampFiltHashSelectedRangeMin Unsigned64TC,
    psampFiltHashSelectedRangeMax Unsigned64TC,
    psampFiltHashOutputRangeMin   Unsigned64TC,
    psampFiltHashOutputRangeMax   Unsigned64TC
}

psampFiltHashIndex OBJECT-TYPE
SYNTAX      Integer32 (1..2147483647)
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
 "The index of this parameter set in the
psampFiltHashParamSetTable. It is used in the
object ipfixSelectionProcessSelectorFunction entries of
the ipfixSelectionProcessTable in the IPFIX-MIB as reference
to this parameter set."
 ::= { psampFiltHashParamSetEntry 1 }

psampFiltHashFunction OBJECT-TYPE
SYNTAX      INTEGER {
    crc32(1),
    ipsx(2),
    bob(3)
}
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
 "The Hash Function used by this filter. The PSAMP-MIB
defines the following Hash Functions:

crc32(1): The CRC32 Hash Function as defined in RFC1141.

ipsx(2): The IPSX Hash Function as described in RFC5475
appendix A.1.

bob(3): The BOB Hash Function as described in RFC5475
appendix A.2.
"
REFERENCE
 "RFC5475, Section 6.2 and Appendixes A.1 and A.2.
RFC1141."
 ::= { psampFiltHashParamSetEntry 2 }

psampFiltHashInitializerValue OBJECT-TYPE
SYNTAX      Unsigned64TC
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
 "This object specifies the initializer value to the hash
function."
REFERENCE
 "RFC5475, Sections 6.2, 3.8, and 7.1"
 ::= { psampFiltHashParamSetEntry 3 }

psampFiltHashIpPayloadOffset OBJECT-TYPE
SYNTAX      Unsigned64TC
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION  "This object specifies the IP payload offset used by a Hash-based Selection Selector."
REFERENCE   "RFC5475, Sections 6.2, 3.8, and 7.1"
::= { psampFiltHashParamSetEntry 4 }

psampFiltHashIpPayloadSize OBJECT-TYPE
SYNTAX      Unsigned64TC
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION  "This object specifies the IP payload size used by a Hash-based Selection Selector."
REFERENCE   "RFC5475, Sections 6.2, 3.8, and 7.1"
::= { psampFiltHashParamSetEntry 5 }

psampFiltHashSelectedRangeMin OBJECT-TYPE
SYNTAX      Unsigned64TC
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION  "This object specifies the value for the beginning of a hash function’s selected range."
REFERENCE   "RFC5475, Sections 6.2, 3.8, and 7.1"
::= { psampFiltHashParamSetEntry 6 }

psampFiltHashSelectedRangeMax OBJECT-TYPE
SYNTAX      Unsigned64TC
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION  "This object specifies the value for the end of a hash function’s selected range."
REFERENCE   "RFC5475, Sections 6.2, 3.8, and 7.1"
::= { psampFiltHashParamSetEntry 7 }

psampFiltHashOutputRangeMin OBJECT-TYPE
SYNTAX      Unsigned64TC
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
"This object specifies the value for the beginning of a hash function’s potential output range."
REFERENCE
"RFC5475, Sections 6.2, 3.8, and 7.1"
::= { psampFiltHashParamSetEntry 8 }

psampFiltHashOutputRangeMax OBJECT-TYPE
SYNTAX      Unsigned64TC
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
"This object specifies the value for the end of a hash function’s potential output range."
REFERENCE
"RFC5475, Sections 6.2, 3.8, and 7.1"
::= { psampFiltHashParamSetEntry 9 }

-- Conformance information
-- Compliance statements

psampCompliances OBJECT IDENTIFIER ::= { psampConformance 1 }
psampGroups      OBJECT IDENTIFIER ::= { psampConformance 2 }

-- Compliance statements

psampCompliance MODULE-COMPLIANCE
STATUS  current
DESCRIPTION
"The implementation of all objects is optional and depends on the implementation of the corresponding functionality in the equipment."
MODULE  -- this module
GROUP psampGroupSampCountBased
DESCRIPTION
"These objects must be implemented if systematic count-based sampling is implemented in the equipment."
GROUP psampGroupSampTimeBased
DESCRIPTION
"These objects must be implemented if systematic time-based sampling is implemented in the equipment."
GROUP psampGroupSampRandOutOfN
DESCRIPTION
"These objects must be implemented if random n-out-of-N sampling is implemented in the equipment."
GROUP psampGroupSampUniFrob
DESCRIPTION
"These objects must be implemented if uniform probabilistic sampling is implemented in the equipment."
GROUP psampGroupFiltPropMatch
DESCRIPTION
"These objects must be implemented if the property match filtering is implemented in the equipment."
GROUP psampGroupFiltHash
DESCRIPTION
"These objects must be implemented if hash filtering is implemented in the equipment."
::= { psampCompliances 1 }

--==================================================================
-- MIB groupings
--==================================================================

psampGroupSampCountBased OBJECT-GROUP
OBJECTS {
  psampSampCountBasedAvail,
  psampSampCountBasedInterval,
  psampSampCountBasedSpace
}
STATUS current
DESCRIPTION
"These objects are needed if count based sampling is implemented."
::= { psampGroups 1 }

psampGroupSampTimeBased OBJECT-GROUP
OBJECTS {
  psampSampTimeBasedAvail,
  psampSampTimeBasedInterval,
  psampSampTimeBasedSpace
}
STATUS current
DESCRIPTION
"These objects are needed if time based sampling is implemented."
::= { psampGroups 2 }

psampGroupSampRandOutOfN OBJECT-GROUP
OBJECTS {
  psampSampRandOutOfNAvail,
  psampSampRandOutOfNSize,
  psampSampRandOutOfNPopulation
}
STATUS current
DESCRIPTION
"These objects are needed if random n-out-of-N sampling is
implemented."
 ::= { psampGroups 3 }

psampGroupSampUniProb OBJECT-GROUP
  OBJECTS {
    psampSampUniProbAvail,
    psampSampUniProbProbability
  }
  STATUS current
DESCRIPTION
"These objects are needed if uniform probabilistic sampling
is implemented."
 ::= { psampGroups 4 }

psampGroupFiltPropMatch OBJECT-GROUP
  OBJECTS {
    psampFiltPropMatchAvail
  }
  STATUS current
DESCRIPTION
"These objects are needed if property match filtering is
implemented."
 ::= { psampGroups 5 }

psampGroupFiltHash OBJECT-GROUP
  OBJECTS {
    psampFiltHashAvail,
    psampFiltHashFunction,
    psampFiltHashInitializerValue,
    psampFiltHashIpPayloadOffset,
    psampFiltHashIpPayloadSize,
    psampFiltHashSelectedRangeMin,
    psampFiltHashSelectedRangeMax,
    psampFiltHashOutputRangeMin,
    psampFiltHashOutputRangeMax
  }
  STATUS current
DESCRIPTION
"These objects are needed if hash filtering is implemented."
 ::= { psampGroups 6 }

END
7. Security Considerations

There are no management objects defined in this MIB module that have a MAX-ACCESS clause of read-write and/or read-create. So, if this MIB module is implemented correctly, then there is no risk that an intruder can alter or create any management objects of this MIB module via direct SNMP SET operations.

All tables in this MIB module may be considered sensitive or vulnerable in some network environments because objects in the tables may reveal information about the network infrastructure and device configuration. 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.

SNMP versions prior to SNMPv3 did not include adequate security. Even if the network itself is secure (for example by using IPsec), 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 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) who have legitimate rights to GET or SET (change/create/delete) them.

8. IANA Considerations

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

<table>
<thead>
<tr>
<th>Descriptor</th>
<th>OBJECT IDENTIFIER value</th>
</tr>
</thead>
<tbody>
<tr>
<td>psampMIB</td>
<td>{ mib-2 xxx }</td>
</tr>
</tbody>
</table>

Further on, IANA will register the following toplevel OIDs in the IPFIX-SELECTOR-MIB Functions sub-registry at http://www.iana.org/assignments/smi-numbers according to the procedures set forth in [RFC6615]:

Dietz, et al. draft-ietf-ipfix-psamp-mib-06.txt [Page 25]
The prerequisites set forth for addition of these OIDs are to be verified based on the content of this document.

Editor’s Note (to be removed prior to publication): the IANA is requested to assign a value for "xxx" under the ‘mib-2’ subtree and to record the assignment in the SMI Numbers registry. When the assignment has been made, the RFC Editor is asked to replace "xxx" (here and in the MIB module) with the assigned value and to remove this note. The RFC editor is also asked to replace "yyyy" in this document and the MIB module by the number of the RFC when the assignment has been made.

9. Acknowledgment

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10. References

10.1. Normative References


10.2. Informative References


Authors’ Addresses

Thomas Dietz (editor)
NEC Europe Ltd.
NEC Laboratories Europe
Kurfuersten-Anlage 36
Heidelberg 69115
DE

Phone: +49 6221 4342-128
Email: dietz@neclab.eu