

Internet Draft
Expiration: May 2002
File: [draft-ietf-rap-feedback-fr-pib-01.txt](#)

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Framework of COPS-PR Policy Information Base for Policy Usage Feedback

Last Updated November 20, 2001

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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](#)].

Abstract

Currently there are no policy classes defined for the PEP to convey provisioned policy usage feedback to the PDP. The purpose of this document is to define the policy usage feedback framework PIB that specifies the policy classes common for COPS feedback reports. The basic operation and objects for reporting usage information are defined in [[COPS](#)]. A specific clientSI feedback object named REPORT is defined in [COPS-PR]. A framework for approaching solicited and periodic usage feedback is described in [COPS-FEED-FRWK.]This

document defines the policy classes for a feedback framework Policy
information base (PIB).

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1 Introduction

The Framework of COPS-PR Usage Feedback describes the overall approach to policy usage monitoring and reporting. This document defines the specific Policy Information Base (PIB) framework for policy usage feedback. The policy classes for monitoring and reporting policy usage feedback as well as policy classes for controlling reporting intervals, suspension, resumption and solicitation are also defined.

2 General Concepts

2.1 Selection, Usage and Linkage Policies

There are three basic types of policy used to define what the PEP is to monitor, record and report. These are the selection criteria policy, the usage policy and the feedback report linkage policy.

The selection criteria policy is installed by the PDP. It defines the conditions used by the PEP to monitor and record a usage policy. Generally, the selection criterion is an existing PRC such as the qosClfrElementEntry. This PRC is useful for specifying conditions on which to base usage - i.e. count the number of packets received for this classified flow.

The usage policy defines what attributes are monitored and recorded by the PEP. These policies have an ACCESS clause of Report. Generally, the usage policies specify counts related to a specific action such as a packet being dropped. The feedback framework PIB defines one usage policy class, frwkFeedbackTrafficUsage. It counts packets and bytes. Usage PRCs may be generic, collecting basic statistics, or they may be specific to a particular usage. The PDP decides which PRC(s) best suit(s) its requirements. The PEP may support only one usage PRC, in which case all statistics are gathered using instances of that PRC. Alternatively, the PEP may support multiple usage PRCs. The PDP then decides which PRC to associate with a particular selection criterion.

A usage policy and selection policy are tightly associated with one another. A third policy is used to associate, or link, the selection and usage policies. The frwkFeedbackLinkTable performs this linking of the selection and usage policies. The feedback report linkage permits the same selection criteria instance to be re-used for various usage policies. The feedback type report linkage references the selection criteria instance as well as defines the policy class of the usage PRC. As noted above, the selection criteria policy may be used for enforcement policies as well as usage policies. This is

the case with qosClfrElementEntry.

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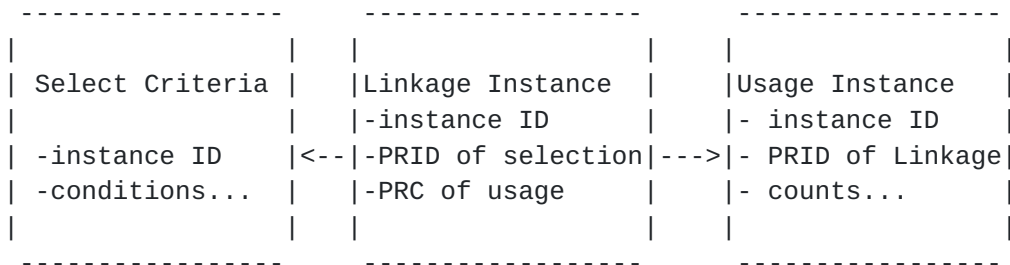


Figure 1

Figure 1 illustrates the relationship between a selection criteria, linkage and usage policies.

The PDP is not aware of the instance identifier of the usage policy when installing the selection criteria and feedback report linkage policies. The usage policy is instantiated on the PEP by the installation of a feedback report linkage and the PEP designates the instance identifier. The usage policy class always contains an attribute of type Prid which contains the value of the associated feedback report linkage PRID [COPS-PR] installed by the PDP. Note that the Prid type is a textual convention for an object identifier that is the PRC of the table used for the feedback report linkage (was - selection criteria) and where the last sub-identifier is an instance ID of the feedback report linkage.

2.2 Normal Operations

2.2.1 Connection Establishment and Initial Configuration Request

The Accounting Timer object in the Connection Accept message contains the minimum number of seconds between reporting intervals as described in [COPS] and [COPS-FEEDBACK-FRWK.] This is used as the basic unit of measurement in defining intervals for specific usage policies with the frwkFeedbackLinkInterval attribute.

The PEP notifies the PDP of the selection criteria policy classes and usage policy classes it supports during the initial request for configuration data using the frwkPRCSupportTable entries [FR-PIB]. The PEP also indicates whether it supports the frwkFeedbackLinkTable as well.

The PDP responds to the initial request for configuration with a DECISION that installs policies. The PDP may also specify maximum reporting intervals associated with each of the usage policies. This is done with the frwkFeedbackLinkInterval attribute in the frwkFeedbackLinkTable instance. It may also specify reporting thresholds by including an instance of a threshold class (e.g.

frwkFeedbackTrafficThresholdTable) in the decision. The PEP monitors and records the usage per the conditions defined by its associated selection criteria policy. Periodically the PEP reports the usage with an feedback type REPORT or provides a REPORT when solicited by

the PDP. The PDP solicits usage feedback with the `frwkFeedbackActionIndicator` attribute of the `frwkFeedbackActionTable`.

2.2.2 Unsolicited Reports - Periodic Reporting

Reporting may be periodic in nature and unsolicited. The intervals at which the unsolicited reports are provided by the PEP are defined in the specific Linkage policies. The defined intervals are based on the number of seconds specified by the PDP in the `ACCT Timer` value. The PDP may specify that the periodic unsolicited report is to only occur if a threshold is reached and/or if the usage value has changed from the previous reporting interval.

There are cases when the PEP must supply unsolicited feedback reports that may not fall on an interval boundary. The PEP **MUST** provide an unsolicited REPORT containing all defined usages instances just prior to the PEP issuing a Delete Request State and just prior to the PEP de-activating a PIB instance context.

2.2.3 Unsolicited Reports - Reporting Conditions

Periodic unsolicited reports for individual linkage objects can be suppressed by specifying additional conditions. Supported conditions are:

ChangeOnly

If this flag is set in the `frwkFeedbackUsageLinkFlags` field, the associated usage instance is only included in a periodic unsolicited report if its value changed since the last unsolicited report.

Threshold

If this flag is set in the `frwkFeedbackUsageLinkFlags` field, the associated usage instance is only included in a periodic unsolicited report, if the threshold condition referenced in the `frwkLinkThreshold` field evaluates successfully for the associated usage instance.

Both conditions can be combined in one `frwkFeedbackLinkUsage` object. In this case both conditions need to succeed for the usage instance to be reported.

Unsolicited reports triggered by a Delete Request State or the deactivation of a PIB instance are not subject to these conditions - all usage objects must be included in these cases.

2.2.4 Solicited Reports

The PDP may solicit policy usage feedback by issuing an unsolicited Decision containing the frwkFeedbackActionIndicator set to SOLICIT USAGE REPORT NOW. The PEP is to provide a solicited REPORT feedback containing usage feedback. The PEP shall continue to provide

periodic feedback as well at the specified intervals established at client connection acceptance.

The reporting conditions (ChangeOnly and Threshold) do not affect solicited reports - all requested usage instances must be included.

2.2.5 Resuming and Suspending Periodic Feedback Reporting

The PDP may suspend usage monitoring and tracking at the PEP with the frwkFeedbackActionIndicator set to SUSPEND USAGE MONITORING AND REPORTS. The PEP must stop tracking usage information and must not issue any feedback reports. The PDP may only suspend feedback reporting by setting the ActionIndicator to SUSPEND REPORTS ONLY. The PEP must cease sending unsolicited reports but is to continue monitoring and tracking usage. The PDP may resume the sending of feedback reports and may resume usage monitoring by setting the ActionIndicator to RESUME USAGE AND REPORTING.

The PDP may suspend or resume for all usage instances or the PDP may specify one or more instances that are to be suspended or resumed. The frwkFeedbackActionList contains a tag identifier that references a list of one or more frwkFeedbackActionListTable entries.

The PDP may halt usage monitoring, tracking and reporting of usage policies by removing the associated Linkage entry.

2.2.6 Failover

In the event the connection is lost between the PEP and PDP, the PEP continues to track usage information as long as it continues to operate with the installed policy. When the locally installed policy at the PEP expires, the usage policy data also expires.

Upon successful reconnection where the PEP is still caching policy, the PDP indicates to the PEP that the PEP may resume sending of the feedback type report messages. The PDP does this deterministically. It issues an unsolicited decision containing the frwkFeedbackResumeIndicator set to resume reporting. The PEP should resume reporting at the next appropriate feedback interval established upon the acceptance of the re-connection. The PDP is aware of the request state Handle(s) and the supported PRCs either through the state synchronization mechanism or because the PDP considers itself synchronized with the PEP upon reconnection.

3 Summary of the Feedback Framework Policy Information Base

3.1 SPPI ACCESS clause report-only

The selection criteria and linkage policy classes follow the definitions specified by [[SPPI](#)]. This structure specifies well-defined policy classes and their instances residing in a common,

virtual repository [[FR-PIB](#)]. The additional PIB-ACCESS clause attribute of "report-only" denotes the usage policy class reported by the PEP.

3.2 Feedback Groups and PRCs

It is useful to define reporting intervals, and suspend, resume, and solicit characteristics as well as the common usage and selection criteria policies. These policy classes are common to account type reporting for various technologies and apply to ALL SUBJECT-CATEGORIES. The policy classes are divided into three new groups, namely, The Feedback Report Group, The Feedback Usage Group and The Feedback Selection Group.

The policy classes in the Feedback Report Group are:

- 1) Feedback Action Table
- 2) Feedback Action List Table
- 3) Feedback Selection Usage Combination Capability Table
- 4) Feedback Linkage Table

The policy classes in the Feedback Usage Group are:

- 1) Feedback Traffic Statistics Usage Table
- 2) Feedback Interface Traffic Statistics Usage Table
- 3) Feedback Traffic Statistics Threshold Table

The policy classes in the Feedback Selection Group are:

- 1) SetWatchPoint Table
- 2) Feedback DPE Selection Criteria Table
- 3) Feedback DPE Selection Query Table
- 4) Feedback DPE Interface Usage Table

3.2.1 Feedback Action Table

The Feedback Action Table contains the attributes that specify action that the PEP is to take regarding policy usage, monitoring and tracking. The PDP may suspend usage monitoring and periodic reporting, suspend periodic reporting only, resume usage and periodic reporting or solicit immediate reporting. The action may affect all feedback policies or be associated with one or more policy instances.

The Feedback Action Indicator defines the action. The Feedback Specific PRI indicates whether the action applies to all of the usage policies or to a list. The Feedback List ID is the identifier of the list of Linkage policy instances to which the action is to be applied.

The PDP can solicit the PEP for immediate usage feedback. The PEP shall respond with a solicited report containing the usage feedback.

The PDP can direct the resumption of usage monitoring and reporting per the defined intervals. For example, the PEP may have re-connected to a PDP and has cached usage policies. The PDP indicates to the PEP to resume usage tracking and monitoring and to send all the cached usage policy. The PEP shall respond at the next appropriate interval with an unsolicited report containing the usage feedback.

The PDP can suspend the monitoring of usage policy. The PEP maintains the current usage that has been monitored but discontinues any further monitoring until the PDP directs the PEP to resume monitoring in a subsequent Decision.

The PDP can also suspend just the reporting of usage, but not interrupt the monitoring and tracking of usage. The PEP shall discontinue sending Report messages with usage feedback until the PDP directs the PEP to resume. The PEP then begins reporting the usage feedback at the next interval.

3.2.2 Feedback List Table

This table contains a list of PRIDs of the linkage table for which the PDP wants feedback reports. The value is referenced by an attribute in the Feedback Resume Table. There may be one or more instances associated with a specific list identifier defined by the Feedback Action List ID.

3.2.3 The Feedback Selection Usage Combination Capability Table

This table defines the valid selection criteria PRC, and usage PRC and threshold PRC combinations supported.

3.2.4 The Feedback Report Linkage Table

This table links the selection criteria instance with the usage instance. It specifies the PRID of the selection criteria and the PRC of the usage instance. This table permits the reuse of a selection criteria instance for multiple usage policies.

The linkage table also permits the definition of a maximum reporting interval to use when issuing the feedback type reports for the usage instance. This interval is defined in units of the Accounting Timer Interval specified in the client accept message. A value of 0 in this attribute indicates that the usage policy must be solicited.

3.2.5 The Feedback Traffic Statistics Usage Table

This table describes the packet counts, byte counts, last timestamp

when a packet was received and the PRID of the associated Feedback Report Linkage instance. The count and timestamp information is monitored and recorded by the PEP and supplied to the PDP with the feedback type report message within the maximum interval specified.

3.2.6 The Feedback Interface Traffic Statistics Usage Table

This table is similar to the table described above, except that it includes an additional reference to an interface. This table should be used with a selection criteria that matches an element that is assigned to multiple interfaces. The interface field can be used to associate the instances of this table with the specific element s assignment.

3.2.7 The Feedback Traffic Statistics Threshold Table

This table is used to provide threshold values for the attributes described in the above usage tables.

3.2.8 The SetWatchPoint Table

This table defines a selection criteria policy that identifies the enforcement policy processing point at which the associated usage policy is to be monitored. This is useful in the data path models where re-use of the enforcement policy occurs and is implemented in a linked fashion. For example, it may be useful to monitor and feedback the packet usage at a specific dropper enforcement policy in the DiffServ PIB.

3.2.9 Feedback DPE Selection Criteria Table

This table is an example of a Selection Criteria PRC that references a specific instance of a shared object.

It is based on the popular model of a data path consisting of multiple linked data path elements (DPEs).

A single data path can be assigned to multiple interfaces by a single entry in the Data Path Table [[DIFFSERV-PIB](#)], elements within this data path however can collect usage information for each assignment individually.

Instances of this class allow the PDP to select a specific assignment of a data path element to be selected for usage reporting. This is achieved by the combination of references to a Data Path Entry, a Data Path Element and the Interface.

It is expected to be used in combination with the FrwkFeedbackTrafficUsage PRC.

3.2.10 Feedback DPE Selection Query Table

This Selection Criteria PRC is similar to the DPE Selection Criteria Table, however it is missing the reference to a specific interface. This means an instance of this class can select multiple assignments of a data path element for usage collection. Each selected

assignment of the DPE creates its own usage instance.
This selection criteria PRC is expected to be used together with a
usage PRC that includes the a reference to an interface, so the
results can be assigned uniquely.

3.2.11 Feedback DPE Interface Usage Table

The DPE Interface Usage class is an extension of the generic Traffic Usage class that also includes a reference to a frwkIfRoleComboEntry that represents the interface, this instance is associated with.

4 The Feedback Framework PIB Module

```
FEEDBACK-FRAMEWORK-PIB PIB-DEFINITIONS ::= BEGIN
```

```
IMPORTS
```

```
    ExtUTCTime, Unsigned32, Unsigned64,  
    Integer32, MODULE-IDENTITY, OBJECT-TYPE  
        FROM COPS-PR-SPPI  
    TruthValue, TEXTUAL-CONVENTION  
        FROM SNMPv2-TC  
    PolicyInstanceId, PolicyReferenceId  
        FROM COPS-PR-SPPI-TC;  
    RoleCombination  
        FROM FRAMEWORK-ROLE-PIB;  
    Counter64  
        FROM SNMPv2-SMI;
```

```
feedbackPolFrameworkPib MODULE-IDENTITY
```

```
    SUBJECT-CATEGORIES { all }  
    LAST-UPDATED "200011171000Z"  
    ORGANIZATION "IETF RAP WG"  
    CONTACT-INFO "
```

```
        Diana Rawlins  
        WorldCom  
        901 International Parkway  
        Richardson, TX 75081  
        Phone: 972 729 1044  
        Email: diana.rawlins@wcom.com
```

```
        Amol Kulkarni  
        JF3-206  
        2111 NE 25th Ave  
        Hillsboro, Oregon 97124  
        Phone: 503-712-1168  
        Email: amol.kulkarni@intel.com
```

```
        Kwok Ho Chan  
        Nortel Networks, Inc.  
        600 Technology Park Drive
```

Billerica, MA 01821 USA
Phone: 978-288-8175
Email: khchan@nortelnetworks.com

Martin Bokaemper
 Unisphere Networks
 700 Silver Seven Road
 Kanata, ON, K2V 1C3, Canada
 Phone: 613-591-2735
 Email: mbokaemper@unispherenetworks.com"

DESCRIPTION

"The PIB module containing the base set of policy rule classes that are required for support of all policy usage monitoring, tracking and reporting policies"

::= { tbd }

--

-- The feedback report group

--

frwkFeedbackGroupClasses

OBJECT IDENTIFIER ::= { feedbackPolFrameworkPib 1 }

--

-- Feedback Action Table

--

frwkFeedbackActionTable OBJECT-TYPE

SYNTAX SEQUENCE OF FrwkFeedbackActionEntry

PIB-ACCESS install

STATUS current

DESCRIPTION

"This class contains a single PRI that indicates that the PEP is to resume the sending of feedback type reports."

::= { frwkFeedbackGroupClasses 1 }

frwkFeedbackActionEntry OBJECT-TYPE

SYNTAX FrwkFeedbackActionEntry

STATUS current

DESCRIPTION

"An instance of this class can indicates a action the PEP is to take regarding the usage policies."

PIB-INDEX { frwkFeedbackActionId }

::= { frwkFeedbackActionTable 1 }

FrwkFeedbackActionEntry ::= SEQUENCE {

frwkFeedbackActionId	InstanceId,
frwkFeedbackActionIndicator	INTEGER,

```
        frwkFeedbackActionSpecificPri    INTEGER,  
        frwkFeedbackActionList           TagReference  
    }
```

frwkFeedbackActionId OBJECT-TYPE

SYNTAX InstanceID

STATUS current

DESCRIPTION

" An arbitrary integer index that uniquely identifies an instance of the frwkFeedbackActionTable class."

::= { frwkFeedbackActionEntry 1}

frwkFeedbackActionIndicator OBJECT-TYPE

SYNTAX INTEGER {

SUSPEND USAGE MONITORING_AND_REPORTS(0)

SUSPEND_REPORTS_ONLY(1)

RESUME_USAGE AND REPORTING(2)

SOLICIT USAGE REPORT NOW(3)

}

STATUS current

DESCRIPTION

"The value indicates if the PEP is to send cached usage policies via feedback type report messages. The enumeration values are:

(0) SUSPEND USAGE MONITORING_AND_REPORTS

(1) SUSPEND_REPORTS_ONLY

(2) RESUME_USAGE AND REPORTING

(3) SOLICIT USAGE REPORT NOW "

::= { frwkFeedbackActionEntry 2 }

frwkFeedbackActionSpecificPri OBJECT-TYPE

SYNTAX TruthValue

STATUS current

DESCRIPTION

"A value of 0 indicates that the frwkFeedbackActionListId attribute should be ignored, and the action applied to all policies. A value of 1 indicates that the action entry has a specific list of policies to which it is to be applied."

::= { frwkFeedbackActionEntry 3}

frwkFeedbackActionList OBJECT-TYPE

SYNTAX TagReference

STATUS current

DESCRIPTION

"Identifies a list of frwkFeedbackActionListTable instances associated with the action described by this instance"

```
::= { frwkFeedbackActionEntry 4}
```

```
--
```

```
-- Feedback Action List Table
```

```
--
```


frwkFeedbackActionListTable OBJECT-TYPE

SYNTAX SEQUENCE OF FrwkFeedbackActionListEntry
 PIB-ACCESS install
 STATUS current
 DESCRIPTION
 "This class contains the PRIDs of the
 linkage instance which are to be impacted by
 the frwkFeedbackActionIndicator for this
 list."
 ::= { frwkFeedbackGroupClasses 2 }

frwkFeedbackActionListEntry OBJECT-TYPE

SYNTAX FrwkFeedbackActionListEntry
 STATUS current
 DESCRIPTION
 "This class identifies a set of linkage instances
 for which the PDP is suspending, resuming or
 soliciting usage feedback."

 PIB-INDEX {frwkFeedbackActionListId }
 UNIQUENESS { frwkFeedbackActionListGroup,
 frwkFeedbackActionListPRID
 }
 ::= { frwkFeedbackActionListTable 1 }

FrwkFeedbackActionListEntry ::= SEQUENCE {
 frwkFeedbackActionListId InstanceID,
 frwkFeedbackActionListGroup TagId,
 frwkFeedbackActionListPRID Prid
 }

frwkFeedbackActionListId OBJECT-TYPE

SYNTAX InstanceId
 STATUS current
 DESCRIPTION
 "Arbitrary integer index that uniquely
 identifies an instance of the class."

 ::= { frwkFeedbackActionListEntry 1 }

frwkFeedbackActionListListGroup OBJECT-TYPE

SYNTAX TagId
 STATUS current
 DESCRIPTION
 "Represents the binding between the Action
 table entry and the Action List table entries"
 ::= { frwkFeedbackActionListEntry 2 }

frwkFeedbackActionListPRID	OBJECT-TYPE
SYNTAX	Prid
STATUS	current
DESCRIPTION	

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"The PRID of the linkage instance(s) belonging to the list of instances identified by the list id upon which the suspend, resume or solicit action is directed."

::= { frwkFeedbackActionListEntry 3 }

--

-- The Feedback Selection Usage Combination Capability Table

--

frwkFeedbackSelUsageComboCapsTable OBJECT-TYPE

SYNTAX SEQUENCE OF FrwkFeedbackSelUsageComboCapsEntry

PIB-ACCESS notify

STATUS current

DESCRIPTION

"This table defines the valid combinations of the selection criteria PRCs, the usage PRCs and the threshold PRCs that the PEP supports."

::= { frwkFeedbackGroupClasses 3}

frwkFeedbackSelUsageComboCapsEntry OBJECT-TYPE

SYNTAX FrwkFeedbackSelUsageComboCapsEntry

STATUS current

DESCRIPTION

"The attributes of this class identify valid combinations of selection criteria, usage and threshold PRCs for feedback supported by the PEP device."

PIB-INDEX {frwkFeedbackActionLinkId}

UNIQUENESS { frwkFeedbackSelUsageComboCapId,
frwkFeedbackSelUsageComboCapSelection,
frwkFeedbackSelUsageComboCapUsage,
frwkFeedbackSelUsageComboCapThreshold
}

::= {frwkFeedbackSelUsageComboTable 1}

FrwkFeedbackSelUsageComboCapsEntry ::= SEQUENCE {

frwkFeedbackSelUsageComboCapId InstanceID,

frwkFeedbackSelUsageComboCapSelection OBJECT IDENTIFIER,

frwkFeedbackSelUsageComboCapUsage OBJECT IDENTIFIER,

frwkFeedbackSelUsageComboCapThreshold OBJECT IDENTIFIER

}

frwkFeedbackSelUsageComboCapId OBJECT-TYPE

SYNTAX InstanceID

STATUS current

DESCRIPTION

" An arbitrary integer index that uniquely identifies an instance of the frwkFeedbackSelUsageComboCapsEntry class."

::= { frwkFeedbackSelUsageComboCapsEntry 1}

frwkFeedbackSelUsageComboCapSelection OBJECT-TYPE

SYNTAX OBJECT IDENTIFIER

STATUS current

DESCRIPTION

"The PRC of the selection class that is supported by the device in the combination defined by this instance."

::= { frwkFeedbackSelUsageComboCapsEntry 2}

frwkFeedbackSelUsageComboCapUsage OBJECT-TYPE

SYNTAX OBJECT IDENTIFIER

STATUS current

DESCRIPTION

"The PRC of the usage policy class that is supported by the device in combination with the selection PRC and the threshold PRC defined in this instance."

::= { frwkFeedbackSelUsageComboCapsEntry 3}

frwkFeedbackSelUsageComboCapThreshold OBJECT-TYPE

SYNTAX OBJECT IDENTIFIER

STATUS current

DESCRIPTION

"The PRC of the threshold class that is supported by the device in the combination defined by this instance."

::= { frwkFeedbackSelUsageComboCapsEntry 2}

--

-- The Feedback Report Linkage Table

--

frwkFeedbackLinkTable OBJECT-TYPE

SYNTAX SEQUENCE OF FrwkFeedbackLinkEntry

PIB-ACCESS Install

STATUS current

DESCRIPTION

"This class associates the selection criteria with the usage policy. It also permit the defining of the max interval used for reporting the usage instance."

::= { frwkFeedbackGroupClasses 4}

frwkFeedbackLinkEntry OBJECT-TYPE

SYNTAX FrwkFeedbackLinkEntry

STATUS current

DESCRIPTION

"This class associates the selection criteria with the usage policy. It also permits the defining of the max interval used for reporting the usage instance."

```
PIB-INDEX {frwkFeedbackActionLinkId}  
UNIQUENESS { frwkFeedbackLinkId,  
             frwkFeedbackLinkSel,  
             frwkFeedbackLinkUsage }
```

```
::= {frwkFeedbackLinkTable 1}
```

```
FrwkFeedbackLinkEntry ::= SEQUENCE {  
    frwkFeedbackLinkId      InstanceID,  
    frwkFeedbackLinkSel     Prid,  
    frwkFeedbackLinkUsage   OBJECT IDENTIFIER,  
    frwkFeedbackLinkInterval Integer32,  
    frwkFeedbackLinkThreshold Prid,  
    frwkFeedbackLinkFlags   BITS  
}
```

```
frwkFeedbackLinkId OBJECT-TYPE  
    SYNTAX      InstanceID  
    STATUS      current  
    DESCRIPTION  
        " An arbitrary integer index that uniquely identifies an  
        instance of the frwkFeedbackLinkTable class."  
    ::= { frwkFeedbackLinkEntry 1}
```

```
frwkFeedbackLinkSel OBJECT-TYPE  
    SYNTAX      Prid  
    STATUS      current  
    DESCRIPTION  
        "The PRID of the selection criteria instance that  
        defines the conditions to use by the PEP for  
        monitoring the usage."  
    ::= { frwkFeedbackLinkEntry 2}
```

```
frwkFeedbackLinkUsage OBJECT-TYPE  
    SYNTAX      OBJECT IDENTIFIER  
    STATUS      current  
    DESCRIPTION  
        "The PRC of the usage policy class that the PEP uses to  
        monitor, record and report."  
    ::= { frwkFeedbackLinkEntry 3}
```

```
frwkFeedbackLinkInterval OBJECT-TYPE  
    SYNTAX      Integer32  
    STATUS      current  
    DESCRIPTION  
        "Maximum interval in units of the value of the  
        Accounting Timer specified by the PDP in the client  
        accept message. A frwkFeedbackLinkInterval of 1 is  
        equal to the value of the Accounting Timer. This value  
        must be 1 or greater. "  
    ::= { frwkFeedbackLinkEntry 4}
```

frwkFeedbackLinkThreshold OBJECT-TYPE
SYNTAX Prid
STATUS current

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```
DESCRIPTION
    "The PRID of the threshold class instance. This
    instance specifies the threshold values for the usage
    policy."
    ::= { frwkFeedbackLinkEntry 5}

frwkFeedbackLinkFlags OBJECT-TYPE
    SYNTAX      BITS {
        periodic(0),
        threshold(1),
        changeOnly(2),
    }
    STATUS      current
    DESCRIPTION
        "This value indicates the reporting basis of the usage
        policy. The feed back may be generated on demand, on a
        periodic basis regardless of a change in value from the
        previous report, on a periodic basis if a change in
        value has occurred, or the usage is reported when an
        identified threshold value in the usage instance has
        been reached.
        If the periodic flag is set, the PEP will provide
        unsolicited reports at the rate specified in
        frwkFeedbackLinkInterval.
        If the periodic flag is not set, reports will only be
        generated when solicited by the PDP.
        The threshold and changeOnly flags make the
        periodic reports conditional - these flags only make
        sense in combination with the periodic flag."

    ::= { frwkFeedbackLinkEntry 6}

--
-- All actual usage classes are in the separate
-- FrwkFeedbackUsageClasses group
--

FrwkFeedbackUsageClasses
    OBJECT IDENTIFIER ::= { feedbackPolFrameworkPib 2 }

--
-- The generic traffic (byte & packet count) usage class
--

frwkFeedbackTrafficUsageTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF FrwkFeedbackTrafficUsageEntry
    PIB-ACCESS   report-only
```

STATUS current

DESCRIPTION

"This class defines the usage attributes that the PEP
is to monitor for plain traffic handling elements

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like filters. All packets and the bytes contained in these packets are counted. It also contains the PRID of the linkage instance associating the selection criteria instance with the usage instance."

```
::= { frwkFeedbackUsageClasses 1}
```

```
frwkFeedbackTrafficUsageEntry OBJECT-TYPE
```

```
SYNTAX          FrwkFeedbackTrafficUsageEntry
```

```
STATUS          current
```

```
DESCRIPTION
```

```
    "Defines the attributes the PEP is to monitor,
    record and report."
```

```
PIB-INDEX {frwkFeedbackTrafficUsageId}
```

```
UNIQUENESS { frwkFeedbackTrafficUsageLinkPRID }
```

```
::= {frwkFeedbackTrafficUsageTable 1}
```

```
FrwkFeedbackTrafficUsageEntry ::= SEQUENCE {
```

```
    FrwkFeedbackTrafficUsageId          InstanceID,
```

```
    frwkFeedbackTrafficUsageLinkPRID    Prid,
```

```
    frwkFeedbackTrafficUsagePacketCount Counter64,
```

```
    frwkFeedbackTrafficUsageByteCount   Counter64
```

```
}
```

```
frwkFeedbackTrafficUsageId  OBJECT-TYPE
```

```
SYNTAX          InstanceId
```

```
STATUS          current
```

```
DESCRIPTION
```

```
    "Arbitrary integer index that uniquely identifies
    an instance of the class."
```

```
::= { frwkFeedbackTrafficUsageEntry 1 }
```

```
frwkFeedbackTrafficUsageLinkPRID  OBJECT-TYPE
```

```
SYNTAX          Prid
```

```
STATUS          current
```

```
DESCRIPTION
```

```
    "The PRID of the Linkage policy instance used to base
    this usage policy instance upon."
```

```
::= { frwkFeedbackTrafficUsageEntry 2 }
```

```
frwkFeedbackTrafficUsagePacketCount OBJECT-TYPE
```

```
SYNTAX          Counter64
```

```
STATUS          current
```

```
DESCRIPTION
```

```
    "The count of packets handled by the associated
    element during the reporting interval."
```

::= {frwkFeedbackTrafficUsageEntry 3}

frwkFeedbackTrafficUsageByteCount OBJECT-TYPE

```

SYNTAX      Counter64
STATUS      current
DESCRIPTION
    "The byte count of packets handled by the associated
    element."
::= { frwkFeedbackTrafficUsageEntry 4}

```

```

--
-- The traffic usage class, qualified for an interface
--

```

```
frwkFeedbackIfTrafficUsageTable OBJECT-TYPE
```

```

SYNTAX      SEQUENCE OF FrwkFeedbackIfTrafficUsageEntry
PIB-ACCESS  report-only
STATUS      current
DESCRIPTION
    "A usage PRC similar to the basic TrafficUsage class
    that also contains a reference to an interface. This
    class should be used with a selection criteria that
    matches an element that is assigned to multiple
    interfaces. The interface field can be used to
    associate the instances of this class with the specific
    element s assignment."
::= { frwkFeedbackUsageClasses 2 }

```

```
frwkFeedbackIfTrafficUsageEntry OBJECT-TYPE
```

```

SYNTAX      FrwkFeedbackIfTrafficUsageEntry
STATUS      current
DESCRIPTION
    "Defines the attributes the PEP is to monitor,
    record and report."
PIB-INDEX {frwkFeedbackIfTrafficUsageId}
UNIQUENESS { frwkFeedbackIfTrafficUsageLinkPRID,
             frwkFeedbackIfTrafficUsageInterface }

::= {frwkFeedbackTrafficUsageTable 1}

```

```
FrwkFeedbackIfTrafficUsageEntry ::= SEQUENCE {
```

```

    FrwkFeedbackIfTrafficUsageId          InstanceID,
    frwkFeedbackIfTrafficUsageLinkPRID    Prid,
    frwkFeedbackIfTrafficUsageInterface    Prid,
    frwkFeedbackIfTrafficUsagePacketCount Counter64,
    frwkFeedbackIfTrafficUsageByteCount   Counter64

```

```
}
```

```
frwkFeedbackIfTrafficUsageId OBJECT-TYPE
```

SYNTAX	InstanceId
STATUS	current
DESCRIPTION	"Arbitrary integer index that uniquely identifies

```
        an instance of the class."
 ::= { frwkFeedbackIfTrafficUsageEntry 1 }

frwkFeedbackIfTrafficUsageLinkPRID  OBJECT-TYPE
    SYNTAX      Prid
    STATUS      current
    DESCRIPTION
        "The PRID of the Linkage policy instance used to base
         this usage policy instance upon."
 ::= { frwkFeedbackIfTrafficUsageEntry 2 }

frwkFeedbackIfTrafficUsageInterface  OBJECT-TYPE
    SYNTAX      Prid
    STATUS      current
    DESCRIPTION
        "The PRID of a frwkIfRoleCombo instance, uniquely
         identifying a specific interface."
 ::= { frwkFeedbackIfTrafficUsageEntry 3 }

frwkFeedbackIfTrafficUsagePacketCount  OBJECT-TYPE
    SYNTAX      Counter64
    STATUS      current
    DESCRIPTION
        "The count of packets handled by the associated element
         during the reporting interval."
 ::= { frwkFeedbackIfTrafficUsageEntry 4 }

frwkFeedbackIfTrafficUsageByteCount  OBJECT-TYPE
    SYNTAX      Counter64
    STATUS      current
    DESCRIPTION
        "The byte count of packets
         handled by the associated element."
 ::= { frwkFeedbackIfTrafficUsageEntry 5 }

--
-- The Threshold class that accompanies the above Usage PRCs
--

frwkFeedbackTrafficThresholdTable  OBJECT-TYPE
    SYNTAX      SEQUENCE OF FrwkFeedbackTrafficThresholdEntry
    PIB-ACCESS  Install
    STATUS      current
    DESCRIPTION
        "This class defines the threshold attributes
         corresponding to usage attributes specified in
         frwkFeedbackTrafficUsageTable,
```

frwkFeedbackIfTrafficUsageTable and other similar usage classes.
The usage object is considered to match the threshold condition if the following expression evaluates to


```

        TRUE :
        {
            byteCond = (ByteThreshold != NULL) ?
                        (ByteThreshold > ByteCounter) : FALSE;
            packetCond (PacketThreshold != NULL) ?
                        (PacketThreshold > PacketCounter) : FALSE;
            return ( byteCond || packetCond );
        }"

 ::= { frwkFeedbackUsageClasses 3}

frwkFeedbackTrafficThresholdEntry OBJECT-TYPE
    SYNTAX          FrwkFeedbackTrafficThresholdEntry
    STATUS          current
    DESCRIPTION
        "Defines the attributes to hold threshold values."
    PIB-INDEX {frwkFeedbackTrafficThresholdId}

 ::= {frwkFeedbackTrafficThresholdTable 1}

FrwkFeedbackTrafficThresholdEntry ::= SEQUENCE {
    FrwkFeedbackTrafficThresholdId          InstanceID,
    frwkFeedbackTrafficThresholdPacketThreshold      Integer64,
    frwkFeedbackTrafficThresholdByteThreshold      Integer64
}

frwkFeedbackIfTrafficThresholdId  OBJECT-TYPE
    SYNTAX          InstanceId
    STATUS          current
    DESCRIPTION
        "Arbitrary integer index that uniquely identifies
         an instance of the class."
    ::= { frwkFeedbackIfTrafficThresholdEntry 1 }

frwkFeedbackIfTrafficThresholdPacketThreshold  OBJECT-TYPE
    SYNTAX          Integer64
    STATUS          current
    DESCRIPTION
        "The threshold, in terms of packets, that must be
         exceeded to trigger a report in the next
         reporting interval."
    ::= { frwkFeedbackIfTrafficThresholdEntry 2 }

frwkFeedbackIfTrafficThresholdByteThreshold  OBJECT-TYPE
    SYNTAX          Integer64
    STATUS          current
    DESCRIPTION
        "The threshold, in terms of bytes, that must be

```

```
exceeded to trigger a report in the next  
reporting interval."  
::= { frwkFeedbackIfTrafficThresholdEntry 3 }
```

```

--
-- All Selection classes are in the separate
-- FrwkFeedbackSelectionClasses group
--

FrwkFeedbackSelectionClasses
    OBJECT IDENTIFIER ::= { feedbackPolFrameworkPib 3 }

--
-- The Set WatchPoint Table
--

frwkFeedbackSetWatchPointTable OBJECT-TYPE
    SYNTAX          SEQUENCE OF FrwkFeedbackSetWatchPointEntry
    PIB-ACCESS      Install
    STATUS          current
    DESCRIPTION
        "This class defines a selection criteria that
        identifies a specific processing point to watch
        for the desired usage. This selection criteria
        may be useful in PIBs that are designed using a
        datapath approach where the policies are linked
        and can be reused within the PIB."

    ::= { frwkFeedbackSelectionClasses 1}

frwkFeedbackSetWatchPointEntry OBJECT-TYPE
    SYNTAX          FrwkFeedbackSetWatchPointEntry
    STATUS          current
    DESCRIPTION
        "Defines the attributes the of the selection
        criteria identifying a specific policy
        where to monitor the associated usage."
    PIB-INDEX { frwkFeedbackSetWatchPointId }

    ::= {frwkFeedbackSetWatchPointTable 1}

FrwkFeedbackSetWatchPointEntry ::= SEQUENCE {
    frwkFeedbackSetWatchPointId          InstanceID,
    frwkFeedbackSetWatchPointPolicyPRID  Prid,
}

frwkFeedbackSetWatchPointId OBJECT-TYPE
    SYNTAX          InstanceId
    STATUS          current
    DESCRIPTION

```

```
        "Arbitrary integer index that uniquely identifies  
        an instance of the class."  
 ::= { frwkFeedbackSetWatchPointEntry 1 }
```

```

frwkFeedbackSetWatchPointPolicyPRID OBJECT-TYPE
    SYNTAX      Prid
    STATUS      current
    DESCRIPTION
        "The PRID of the enforcement policy instance where
         the associated usage is to be monitored."

    ::= { frwkFeedbackSetWatchPointEntry 2 }

--
-- DPE Selection Class
--

frwkFeedbackDPESelectionTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF frwkFeedbackDPESelectionEntry
    PIB-ACCESS   Install
    STATUS      current
    DESCRIPTION
        "This class defines a selection criteria that
         identifies a specific data path element to collect
         usage information"

    ::= { frwkFeedbackSelectionClasses 2}

frwkFeedbackDPESelectionEntry OBJECT-TYPE
    SYNTAX      frwkFeedbackDPESelecyionEntry
    STATUS      current
    DESCRIPTION
        "Defines the attributes the of the selection
         criteria identifying a specific policy
         where to monitor the associated usage."
    PIB-INDEX { frwkFeedbackDPESelectionId }
    UNIQUENESS { frwkFeedbackDPESelectionDataPathElement,
                  frwkFeedbackDPESelectionInterface,
                  frwkFeedbackDPESelectionIfDirection }

    ::= {frwkFeedbackDPESelectionTable 1}

frwkFeedbackDPESelectionEntry ::= SEQUENCE {
    frwkFeedbackDPESelectionId          InstanceId,
    frwkFeedbackDPESelectionDataPathElement    Prid,
    frwkFeedbackDPESelectionInterface        Prid,
    frwkFeedbackDPESelectionIfDirection    IfDirection
}

frwkFeedbackDPESelectionId OBJECT-TYPE
    SYNTAX      InstanceId
    STATUS      current

```

DESCRIPTION

"Arbitrary integer index that uniquely identifies
an instance of the class."

::= { frwkFeedbackDPESelectionEntry 1 }

```
frwkFeedbackDPESelectionDataPathElement  OBJECT-TYPE
    SYNTAX      Prid
    STATUS      current
    DESCRIPTION
        "The PRID of the element in the data path that we
        want to collect usage information from. This element
        must be part of the data path assigned to the
        interface/direction combination referenced in this
        object."
    ::= { frwkFeedbackDPESelectionEntry 2 }

frwkFeedbackDPESelectionInterface  OBJECT-TYPE
    SYNTAX      Prid
    STATUS      current
    DESCRIPTION
        "The PRID of a frwkIfRoleCombo instance, uniquely
        identifying a specific interface"
    ::= { frwkFeedbackDPESelectionEntry 3 }

frwkFeedbackDPESelectionIfDirection  OBJECT-TYPE
    SYNTAX      IfDirection
    STATUS      current
    DESCRIPTION
        "The direction (ingress/egress) that to which the DPE
        is attached that we want to match."
    ::= { frwkFeedbackDPESelectionEntry 4 }

--
-- DPE Selection Query Class
--

frwkFeedbackDPESelectionQueryTable  OBJECT-TYPE
    SYNTAX      SEQUENCE OF frwkFeedbackDPESelectionQueryEntry
    PIB-ACCESS  Install
    STATUS      current
    DESCRIPTION
        "This class defines a selection criteria that
        identifies a set of assignments of a data path element
        based on an entry in the Data Path Table
        Each matched assignment will collect and report usage
        independently, so this selection criteria should be
        combined with a Usage PRC that includes an interface
        reference."
    ::= { frwkFeedbackSelectionClasses 3}
```

frwkFeedbackDPESelectionQueryEntry	OBJECT-TYPE
SYNTAX	frwkFeedbackDPESelectionQueryEntry
STATUS	current
DESCRIPTION	


```

        "Defines the attributes the of the selection
        criteria identifying a specific policy
        where to monitor the associated usage."
PIB-INDEX { frwkFeedbackDPESelectionQueryId }
UNIQUENESS { frwkFeedbackDPESelectionQueryDataPath,
              FrwkFeedbackDPESelectionQueryDataPathElement }

 ::= { frwkFeedbackDPESelectionQueryTable 1 }

frwkFeedbackDPESelectionQueryEntry ::= SEQUENCE {
    frwkFeedbackDPESelectionQueryId      InstanceId,
    frwkFeedbackDPESelectionQueryDataPath      Prid,
    frwkFeedbackDPESelectionQueryDataPathElement Prid
}

frwkFeedbackDPESelectionQueryId  OBJECT-TYPE
    SYNTAX      InstanceId
    STATUS      current
    DESCRIPTION
        "Arbitrary integer index that uniquely identifies
        an instance of the class."
    ::= { frwkFeedbackDPESelectionQueryEntry 1 }

frwkFeedbackDPESelectionQueryDataPath  OBJECT-TYPE
    SYNTAX      Prid
    STATUS      current
    DESCRIPTION
        "The PRID of a Data Path instance, identifying a
        group of data path assignments."
    ::= { frwkFeedbackDPESelectionQueryEntry 2 }

frwkFeedbackDPESelectionQueryDataPathElement  OBJECT-TYPE
    SYNTAX      Prid
    STATUS      current
    DESCRIPTION
        "The PRID of the element in the data path that we
        want to collect usage information from. This element
        must be part of the data path referenced from the
        frwkFeedbackDPESelectionQueryDataPath field."
    ::= { frwkFeedbackDPESelectionQueryEntry 3 }

END

```

5 Security Considerations

The feedback information is sensitive and requires that authorized messaging occur between the PEP and the PDP. This protection can be accomplished with IPSEC between the PEP and the PDP or using the security mechanisms described in the base COPS protocol.

6 Acknowledgements

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The authors would like to thank Dave Durham and Russell Fenger of Intel and John K. Gallant of WorldCom for their contribution to this document.

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