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SERIES Q: SWITCHING AND SIGNALLING

Signalling requirements and protocols for the NGN – Resource control protocols

Resource control protocol No. 3 – Protocol at the interface between a Policy Decision Physical Entity (PD-PE) and a Policy Enforcement Physical Entity (PE-PE): COPS alternative version 2

Recommendation ITU-T Q.3303.1

ITU-T Q-SERIES RECOMMENDATIONS

SWITCHING AND SIGNALLING

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Resource control protocol No. 3 − Protocol at the interface between a Policy Decision Physical Entity (PD-PE) and a Policy Enforcement Physical Entity (PE-PE): COPS alternative version 2

Summary

Recommendation ITU-T Q.3301.1 specifies the resource control protocol No. 3 (rcp3) COPS profile at the Rw interface, i.e., between the policy decision physical entity (PD-PE) and the policy enforcement physical entity (PE-PE) in the resource and admission control function block. This protocol profile allows the final admission policy decisions to be installed (i.e., either push or pull mode) to a PE-PE from a PD-PE, supports resource control for both fixed and mobile networks and supports the network address port translation (NAPT) control and network address translation (NAT) traversal at PE-PEs as needed. It satisfies the requirements for information flows across the Rw reference point as specified in clause 9.2 of ITU-T Y.2111 and in Supplement 51 to the ITU-T Q-series.

History

Edition	Recommendation	Approval	Study Group
1.0	ITU-T Q.3303.1	2007-08-06	11
2.0	ITU-T Q.3303.1 v2	2012-08-13	11

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications, information and communication technologies (ICTs). The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

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INTELLECTUAL PROPERTY RIGHTS

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As of the date of approval of this Recommendation, ITU had not received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementers are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database at http://www.itu.int/ITU-T/ipr/.

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Resource control protocol No. 3 – Protocol at the interface between a Policy Decision Physical Entity (PD-PE) and a Policy Enforcement Physical Entity (PE-PE): COPS alternative version 2

1   Scope

This Recommendation provides the stage 3 technical specifications for the common open policy service (COPS) profile at the interface between the policy decision physical entity (PD-PE) and the policy enforcement physical entity (PE-PE). The functional requirements and the stage 2 specifications for this interface are defined in clause 9.2 of [ITU-T Y.2111] and in [b-ITU-T Q.Sup51].

This protocol profile allows the final admission decisions to be installed (i.e., either push or pull mode) to a PE-PE from a PD-PE, supports the resource control for both fixed and mobile access networks, and supports the network address port translation (NAPT)/firewall control and network address translation (NAT) traversal at the PE-PE as needed.

This Recommendation provides resource control procedure, protocol profile, modifications to COPS, messages and the definition and application of the policy information base (PIB).

2   References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

[ITU-T Y.2111]   ITU-T Y.2111 (2011), *Resource and admission control functions in next generation networks*.

[ETSI TS 129 212] ETSI TS 129 212 V8.16.0 (2012), *Universal Mobile Telecommunications System (UMTS); LTE; Policy and Charging Control (PCC) over Gx/Sd reference point (3GPP TS 29.212 version 8.16.0 Release 8).*

[IETF RFC 2748]   IETF RFC 2748 (2000), *The COPS (Common Open Policy Service) Protocol.*

[IETF RFC 3084]   IETF RFC 3084 (2001), *COPS Usage for Policy Provisioning (COPS-PR).*

[IETF RFC 3159]   IETF RFC 3159 (2001), *Structure of Policy Provisioning Information (SPPI).*

[IETF RFC 3289]   IETF RFC 3289 (2002), *Management Information Base for the Differentiated Services Architecture.*

[IETF RFC 3318]   IETF RFC 3318 (2003), *Framework Policy Information Base.*

[IETF RFC 4001]   IETF RFC 4001 (2005), *Textual Conventions for Internet Network Addresses.*

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 client handle [IETF RFC 2748]: The client handle is used to identify a specific request state.

3.1.2 policy information base [IETF RFC 3084]: The database of policy information.

3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

3.2.1 COPS connection: The term "connection" is used in this Recommendation to refer to a COPS signalling relationship established between the PD-PE, acting in the role of a COPS Policy Decision Point (PDP), and the PE-PE, acting in the role of a COPS Policy Enforcement Point (PEP).

3.2.2 policy decision physical entity (PD-PE): The PD-PE is an implemented instance of the Policy Decision Functional Entity (PD-FE) as defined in [ITU-T Y.2111].

3.2.3 policy enforcement physical entity (PE-PE): The PE-PE is an implemented instance of the Policy Enforcement Functional Entity (PE-FE) as defined in [ITU-T Y.2111].

3.2.4 flow ID: Identifier for the individual media flow within a session.

NOTE – A flow ID is usually created by the PD-PE.

3.2.5 flow information: Describes the features of the media flow (e.g., filter and filter status) as specified in clause 9.3.

3.2.6 traffic information: Describes the features of the media flow (e.g., peak bandwidth, average bandwidth, and max package length) as specified in clause 9.4.

3.2.7 label stack: Label stack is used to record the multiprotocol label switching (MPLS) network path for a bearer network employing MPLS technology. The information contained in the stack is the labels through a path; the last in first out (LIFO) algorithm is used.

3.2.8 connection information: The core network ingress/egress path information at the PE-PE for a media flow (e.g., label stack or VLAN ID) as specified in clause 9.5.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

AVP	Attribute Value Pair
CAR	Committed Access Rate
COPS	Common Open Policy Service
COPS-PR	COPS usage for Policy Provisioning
CPE	Customer Premises Equipment
CPERR	Class Provisioning Error (of a PRC)
DEC	Decision message
Diffserv	Differentiated Services
DRQ	Delete Request state message
DSCP	Differentiated Services Code Point

DS-TE	Differentiated Services-Traffic Engineering
EPD	Encoded Provisioning Instance Data
GPERR	Global Provisioning Error
GPRS	General Packet Radio Service
IP	Internet Protocol
LIFO	Last In First Out
LSP	Label Switched Path
MAC	Media Access Control
MPLS	Multiprotocol Label Switching
NACE	Network Attachment Control Entity
NAPT	Network Address Port Translation
NAT	Network Address Translation
PDP	Policy Decision Point
PD-PE	Policy Decision Physical Entity
PEP	Policy Enforcement Point
PE-PE	Policy Enforcement Physical Entity
PIB	Policy Information Base
PRC	Provisioning Class
PRI	Provisioning Instance (of a PRC)
PRID	Provisioning Instance Identifier
QinQ	802.1Q in 802.1Q
QoS	Quality of Service
REQ	Request message
RPT	Report state message
RTCP	Real-Time Control Protocol
RTP	Real-Time Protocol
SCE	Service Control Entity
SPPI	Structure of Policy Provisioning Information
TRC-PE	Transport Resource Control Physical Entity
UDP	User Datagram Protocol
UE	User Equipment
UMTS	Universal Mobile Telecommunications System
VLAN	Virtual Local Area Network

5 Conventions

None.

6 Resource control procedures

6.1 SCE-requested resource control procedures

6.1.1 Procedures at the PD-PE

6.1.1.1 Session initiation

6.1.1.1.1 Transport subscription profile verification

The policy decision physical entity (PD-PE) shall verify the transport subscription profile received from the network attachment control entity (NACE) using the globally unique IP address information or transport subscriber identifier as the index.

The PD-PE shall derive the quality of service (QoS) class, reservation priority, and maximum uplink/downlink bandwidth based on the resource requestor identifier, resource request priority and media profile of the resource initiation request received from the service control entity (SCE). The PD-PE shall also verify the transport subscription profile to which the request applies for each IP media flow. In this verification process the derived parameters shall match the information obtained from the NACE. If the transport subscription profile does not contain any data, the PD-PE shall apply a default profile to the request.

NOTE – The Ru interface is out of the scope of this Recommendation.

6.1.1.1.2 Transport resource detection and admission

The PD-PE shall request the transport resource control physical entity (TRC-PE) for transport resource availability detection and for an admission decision via the Rt interface. The PD-PE shall utilize the result of transport resource availability detection and the admission decision to make the policy decision.

NOTE – The Rt interface is out of the scope of this Recommendation.

6.1.1.1.3 Initial policy decisions

The PD-PE shall make initial policy decisions for all IP media flows conveyed by the resource initiation request from the SCE based on all information described in clause 8.2.5.2 of [ITU-T Y.2111], including:

– service information received from the SCE;

– transport subscription profiles;

– service based network policies;

– transport resource availability and admission decision information received from the TRC-PE.

An initial request from the SCE can be accepted by the PD-PE if all conditions are met for all IP media flows in the session. If the request is accepted, the PD-PE shall send a resource initiation response back to the SCE and include a successful Resource Request Result code. Otherwise, the PD-PE may include the available resource information in the resource initiation response if the reason for authorization failure is due to insufficient resources.

The PD-PE will process simultaneous requests from the SCE based on the priority level specified in the Resource Request Priority, which is also sent to the PE-PE. If the Resource Request Priority is not specified, the requested priority is set to the default value.

The PD-PE will create a group of provisioning instances for each IP media flow in the session and request installation in the PE-PE by issuing a DEC message to the PE-PE. The details of the DEC message are described in clause 8.2. The PD-PE is notified that the decision has been carried out successfully, or has failed in the PE-PE.

In addition, the policy decisions shall contain the following information:

IP media flow description

The PD-PE shall derive the uplink and downlink packet classifiers from the IP addresses and port numbers for uplink and downlink IP flows provided by the SCE. The PD-PE shall not modify the address and port information received from the SCE.

QoS information

The QoS information (consisting of maximum QoS class and bandwidth requirements) for IP media flows is extracted from the service information received from the SCE (e.g., from the media type, bandwidth information, service class and the SCE application ID).

The PD-PE may select the QoS class that is the highest class applicable for the media. The PD-PE shall use the same QoS class for both the uplink and the downlink directions when both directions are used. The selection of network class is also dependent on network policies.

The PD-PE shall authorize the contained bandwidth value in the resource initiation request received from the SCE according to network policies, transport subscription profile and resource availability. By default, the bandwidth value contains all overhead from the IP-layer and the upper layers (e.g., IP, UDP, RTP and RTP payload).

Resource control actions

Based on the flow status in the resource initiation request received from the SCE, the PD-PE shall decide what resource control actions to take: either Reservation only or ReservationandCommitment together.

The Reservation only action requests the PE-PE to enforce the initial policy decisions (e.g., to reserve the authorized bandwidth) without forwarding the packets. It is used when the RwFlowInfoFilterStatus attribute of RwFlowInfoEntry is "closed." The ReservationandCommitment action requests the PE-PE to enforce the initial policy decisions (e.g., reserve the authorized bandwidth) and forward the packets. It is used when the RwFlowInfoFilterStatus attribute of RwFlowInfoEntry is "open."

The RwFlowInfoEntry instance in the DEC message indicates the resource control action for each individual IP media flow or group of IP media flows if needed and applicable.

Path selection information

The PD-PE locates core networks that are involved to offer the requested QoS resources and the PE-PE instances that are involved to enforce the final admission decisions based on the information including service information received from the SCE, access information from the NACE, and service based network policies involved in the PD-PE. The path between ingress and egress points is selected by the TRC-PE. The PD-PE may send the path selection information for a media flow received from the TRC-PE to ingress and egress PE-PEs in a DEC message.

Path selection information is based on the bearer network technology and will contain LSP information if MPLS is employed, otherwise it will contain the VLAN ID information.

NAT traversal and NAPT information

In order to request the address latching and address translation operations in the PE-PE, when hosted NAT traversal is detected by the SCE (e.g., the Latching-Indication AVP is set to LATCH (0) by the SCE), the PD-PE will include the type of NAT or latching indication (or both), together with the address information of each flow terminated in the access and core network to the PE-PE.

Firewall working mode selection information

Based on the service information provided by the SCE, the PD-PE shall facilitate appropriate dynamic firewall working mode selection. The PD-PE pushes the dynamic firewall working mode selection for a media flow to the PE-PE on the Rw interface. The following four packet inspection modes could be identified :static packet filtering, dynamic packet filtering, stateful inspection and deep packet inspection. The PE-PE shall inspect and drop packets based on security policy rules and gates which are received from the PD-PE.

6.1.1.2   Session modification

Upon receipt of the resource modification request from the SCE with modified service information or local triggers due to network policies, configuration and conditions, the PD-PE shall perform the transport subscription verification and transport resource detection and admission, and update the policy decision as described in clauses 6.1.1.1.1 to 6.1.1.1.3 for all new or modified media components, based on the state information stored locally.

The updated policy decision is sent to the PE-PE using a DEC message with an existing Client Handle, which contains the install decisions.

Depending on the value of flow-status AVP received from the SCE, the PD-PE shall interpret the session modification as one of the following:

1)   modification of requested resources;

2)   commitment of requested resources;

3)   removal of requested resources.

The modification of requested resources may request the addition of IP media flows or the modification of the attributes of existing IP media flows (e.g., bandwidth or the lifetime of a resource control session (or both) in case of soft-state reservation) without forwarding the packets (i.e., when the gate is closed). When an IP media flow is put on hold, the PD-PE shall retain all session state information and may send the request to the PE-PE to close the gate. The real-time control protocol (RTCP) gate shall be left open to keep the connection alive. The commitment of requested resources may request the allocation or activation of previously reserved resources, or of additional requested resources, or both, (e.g., new media components) and open the gates for all related IP media flows. The removal of requested resources may request the revocation of previously committed or reserved resources, or both, and close the gates for all related IP media flows.

The corresponding resource control actions shall be included in the updated policy decision according to modification requests detailed above.

6.1.1.3   Session termination

The session termination may be initiated by the PD-PE upon receipt of a termination request from the SCE or, when triggered by pre-defined static policies inside the PD-PE.

Upon receipt of the resource release request from the SCE, the PD-PE shall release all relevant resources and provisioning instances and send a DEC remove message, with the Decision Flag set to push-state, to the PE-PE in order to revoke all requested resources and close the gates for all related IP media flows.

When session termination is triggered by local policies and conditions, the PD-PE shall release all relevant resources and session states and send an Abort Resource request to the SCE. The PD-PE will also send a DEC remove message to the PE-PE, (as described in clause 7.2.2), if the request state was originally created by the PD-PE or when the request state was originally created by the PE-PE (as described in clause 3.2 of [IETF RFC 3084]).

6.1.1.4   Event notification

The PD-PE may request notification of certain events (e.g., bearer failure) by specifying them in the RwEventIndicatorGroup in ITU-T Rw PIB, which includes event notifications such as:

1)   Charging correlation exchange;

2)   Indication of loss of bearer;

3)   Indication of recovery of bearer;

4)   Indication of release of bearer;

5)   deviceoverload;

6)   devicerecoverfromoverload.

Extra events can be added.

6.1.2   Procedures at the PE-PE

6.1.2.1   Session initiation

Upon receipt of a DEC message from the PD-PE, the PE-PE shall map them into its local QoS mechanisms, install the initial policing decision and inform the PD-PE if the policy data is installed (Report-Type = 'Success') or not (Report-Type = 'Failure').

When the RwFlowInfoFilterStatus attribute value is set to "close" in the DEC message, the PE-PE shall install the initial policy decisions without any commitment operations, and the gates shall be closed for the related IP media flow. When the RwFlowInfoFilterStatus attribute value is set to "open" in the initial DEC install message, the PE-PE shall commit the requested resources and open the gates for the related IP media flow using the packet filters defined in the RwFlowInfoFilter attribute.

When the RwFlowBasedDecInfoNatAction attribute value is not set to zeroDotZero, the PE-PE shall populate the address translation information to RwFlowDescSingleFlowGroup and include them in the RPT message to the PD-PE.

The PE-PE shall inspect and drop packets based on security policy rules and gates which are indicated in the RwSingleFlowInfoFirewallmodeIndication attribute received from the PD-PE.

6.1.2.2   Session modification

Upon receipt of a DEC message with an existing client handle received from the PD-PE, and when the command-code is set to "install" in the Decision Flags, the PE-PE will reinstall the policy decision. When the command-code is set to "install" in the Decision Flags and the PRID in the named decision data object is an existing one, the PE-PE will reinstall and update the policy decision.

The PE-PE may perform the following operations:

–   Install policy decision for a new IP media flow without committing the requested resources if the RwFlowInfoFilterStatus attribute is set to "close".

–   Install policy decision and commit the requested resources for a new IP media flow if the RwFlowInfoFilterStatus attribute is set to "open".

–   Modify policy decision for an existing IP media flow without committing the requested resources if the RwFlowInfoFilterStatus attribute is set to "close" (e.g., increase or decrease the allocated bandwidth, but the RTCP gate may remain in the open status).

–   Modify policy decision and commit the requested resources for an existing IP media flow if the RwFlowInfoFilterStatus attribute is set to "open" (e.g., open the gates with modified bandwidth).

–   Commit the requested resources for an existing IP media flow if the RwFlowInfoFilterStatus attribute is set to "close" (e.g., open the gates with reserved bandwidth).

–   Revoke the installed policy decisions and release the committed or reserved resources for all related IP media flows which are not included in RwFlowbasedDecInfoGroup.

The PE-PE may also disable the commitment of requested resources by closing the gate but retaining the session state information and transport resources if the RwFlowInfoFilterStatus attribute is set to "close" for a prior enabled IP media flow.

6.1.2.3   Session termination

If the session termination is initiated by the PD-PE, upon receipt of resource release request from the SCE, the PE-PE shall disable the relevant gates and release the network resources.

6.1.2.4   Event notification

The PE-PE may send a notification to the PD-PE if the event specified by the RwEventIndicatorGroup occurs.

The event notification is sent to the PD-PE through an RPT message.

6.1.2.5   Policy enforcement operations

QoS mapping

When QoS information (e.g., QoS Class, peak bandwidth of UL and DL) is received from the PD-PE, the PE-PE shall perform the mapping between the network QoS and the transport QoS by the translation/mapping function, which maps the generic QoS class into the transport QoS class for a specific network technology (e.g., translation into UMTS QoS class for GPRS access networks, or translation into DiffServ code point for DS-TE enabled MPLS). The mapping rules are subject to relevant standards and network operator's local policy (e.g., the table for UMTS QoS mapping). Typically, the mapping rules can be preconfigured in the PE-PE and may be updated via the policy provisioning system or via the Rw interface as needed.

The PE-PE shall select a transport bearer to carry the requested traffic based on the matching transport QoS class.

In addition, the PE-PE shall select an existing transport bearer to allocate the resource for corresponding IP media flows or make a decision to create a new transport bearer for the corresponding IP media flows based on the matching QoS class.

Gate operation

The policy decision to open or close the gate shall lead to the enabling or disabling of the passage of corresponding IP packets. When the gate is closed all packets of the related IP flows shall be dropped. When the gate is opened the packets of the related IP flows are allowed to pass through. The RwFlowInfoFilterStatus attribute in the DEC message indicates the resource control action for each individual IP media flow or group of IP media flows if needed and applicable.

Upon receipt of the DEC message, from the PD-PE, for the initiation or modification of a policy decision, the PE-PE shall perform the gate operation for each IP media flow as follows:

–   Open the gate for IP flows specified in RwFlowInfoFilter if the RwFlowInfoFilterStatus attribute is set to "open".

–   Close the gate if the RwFlowInfoFilterStatus attribute is set to "close", but the RTCP gate may be kept open.

–   Close all relevant gates including the RTCP gate if the command-code in the decision flags is set to "remove".

User plane operation

The PE-PE shall enforce the policy decision of resource control-based "gating" functionality according to additional information received from the PD-PE.

When the policy decision is installed and activated, the PE-PE shall evaluate the packets against IP media flow filters provided by the PD-PE or predefined in static policy rules for all transport bearers in order of precedence of the policy decisions or the predefined static policy rules.

When a packet matches an IP media flow filter, the policy decisions for that filter shall be applied, as follows:

– Bandwidth allocation/policing information provided by the RwFlowDirDescFluxInfo attribute;

– Packet marking/remarking information provided by the RwFlowDirDescInfo attribute;

– NAPT translation and address latching/translation information provided by the RwSingleFlowInfoFlowTermination, RwSingleFlowInfoAddressRealm, RwSingleFlowInfoLatchingIndication attributes;

– Firewall working mode information provided by the RwSingleFlowInfoFirewallmodeIndication attribute.

The IP packets shall be transported within the specific transport bearer (e.g., a VLAN or LSP) where the selected policy decision is mapped.

The IP packets that do not match any IP media flow filters provided by the policy decisions shall be silently discarded.

6.2 UE-requested resource control procedures

6.2.1 Procedures at the PD-PE

6.2.1.1 Initial reservation

When the UE requests a transport resource via the transport signalling message, the pull mode shall be employed in support of resource control procedures.

Upon receipt of a Request from the PE-PE with a new client Handle, the PD-PE shall send a resource action request to the SCE to retrieve the service information of the flow if the SCE previously requested the QoS initial authorization related to that flow.

The PD-PE shall perform the binding operation to establish the association between the Request and the pre-authorized resource control session or pre-configured policy based on the binding information provided by the request. Detailed bearer binding mechanisms are described in clause 6.2.1.5.

If the request is authorized, the PD-PE should perform the relevant operations described in clauses 6.1.1.1.1 and 6.1.1.1.2. Only when all conditions are satisfied will the PD-PE create a group of provisioning instances for each IP media flow or each user requested by the PE-PE. The PD-PE will then send a DEC message with the initial policy decisions and the same client handle specified in the REQ message to the PE-PE.

The PD-PE is notified that the decision has been carried out successfully, or has failed in the PE-PE.

6.2.1.2 Session modification

Upon receipt of the Request with an existing client Handle, the PD-PE shall perform the same reservation procedure as described in clause 6.2.1.1, including resource action request to the SCE if necessary, the binding operation, transport subscription profile verification, and transport resource detection and admission. As a response, the PD-PE shall send a DEC message to the PE-PE with

the policy decision for new or modified IP media flows including IP media flow descriptions, QoS information, path selection information and NAT traversal/NAPT information.

Additionally, the PD-PE shall be able to push down updated policy decisions triggered by the SCE or local policies without explicit request of the PE-PE in the pull mode. The relevant procedures are the same as session modification of push mode described in clause 6.1.1.2.

Depending on the value of the flow status received from the SCE or the RwFlowInfoEntry instance received from the PE-PE through the AA-Request or Request, the PD-PE shall interpret the session modification as one of the following:

1) modification of requested resources;

2) commitment of requested resources;

3) removal of requested resources.

The detailed procedures are described in clause 6.1.1.2. For certain access networks, such as GPRS, alternative approaches may be used such as those described in [ETSI TS 129 212].

6.2.1.3 Session termination

Upon receipt of a DRQ message from the PE-PE, the PD-PE shall release all relevant resources and session state and notify the SCE of the session termination.

6.2.1.4 Event notification

The detailed procedures are described in clause 6.1.1.4.

6.2.1.5 Binding operations

Upon receipt of a Request, the PD-PE shall perform the binding operation to identify the pre-authorized resource control session along with policy decisions. The PD-PE may compare the flow identifier conveyed by the request from the PE-PE with the pre-authorized flow filter information stored in the PD-PE. If more than one flow identifier is included, the PD-PE shall also verify that the media components identified by the flow identifiers are allowed to be transferred in the same UE transport session. The PD-PE may also utilize information such as the user identification, globally unique IP address, etc., to acquire corresponding policy.

The flow identifier can be provided by the RwFlowInfoFilter instance of Request, which includes the source/destination IP addresses and port numbers.

The pre-authorized flow filter in the PD-PE is obtained from the media profile of the resource initiation request received from the SCE during the initial authorization.

6.2.2 Procedures at the PE-PE

6.2.2.1 Session initiation

Upon receipt of an initial transport signalling message from the UE for establishing a new UE transport session, the PE-PE shall send a REQ message with a new client handle.

The PE-PE shall provide flow identifiers to allow the PD-PE to identify the policy decisions to be applied. In addition, the PD-PE may provide other information such as user identification and the physical or logical (or both) connection of the access transport network to which the CPE is attached.

6.2.2.2 Session modification

Upon receipt of a transport signalling message from the UE to modify an existing UE transport session, the PE-PE shall send a REQ message to the PD-PE with an existing client handle.

6.2.2.3 Session termination

When the request state is no longer needed, (e.g., when an interface goes down or when the last transport bearer or IP media flow within an UE transport session is being terminated), the PE-PE shall send a DRQ message with a proper reason object to inform the PD-PE that the request state specified by the client handle is to be deleted.

6.2.2.4 Event notification

The detailed procedures are described in clause 6.1.2.4.

6.2.2.5 Policy enforcement operations

The detailed procedures are described in clause 6.1.2.5.

In addition, the PE-PE may make local decisions based on stored policy decision information of an active UE transport session, when the UE requests a UE transport session modification via the transport signalling message.

6.2.2.6 Binding operations

The binding operations are performed by the PE-PE to identify the correct PD-PE and subsequently to allow policy decision information to be requested from the PD-PE.

The PE-PE shall determine the IP address of the corresponding PD-PE from information in the transport signalling message received from the UE. This information may include flow identifier or other information such as the user identification, globally unique IP address, etc.

7 Protocol profile specification

7.1 Protocol support

The Rw interface shall conform to the IETF COPS framework as a requirement and guideline for stage 3 specifications, and shall also conform to the COPS-PR procedures and data models defined in [IETF RFC 3084].

This Recommendation makes use of a modified version of the COPS protocol specified in [IETF RFC 2748] and [IETF RFC 3084]. The modification is described below. Unless explicitly indicated, the procedures and data models defined in [IETF RFC 3084] remain unmodified. The COPS protocol supports a client/server interface between the PD-PE and the PE-PE. The PE-PE serves as a PEP and a client, and the PD-PE serves as a PDP and a server.

COPS implementations supporting this Recommendation shall support the COPS client type 0x800c (ITU-T Rw PIB) and shall support the PIB defined in Annex A.

7.2 Modifications to COPS-PR

In order to implement push mode operation more efficiently for the ITU-T Rw PIB client type, this Recommendation provides a means whereby the PD-PE can create a new state and can also associate that state with a new client handle value, both within the same message. The PD-PE can also delete state and corresponding client handle values via a COPS DEC message.

A mechanism to assign the client handle in the PD-PE and the PE-PE is required to avoid collisions.

These modifications are implemented by means of new decision flag values in the COPS DEC message, as follows:

– The flag value 0x03 is referred to as the "request-prefix" flag.
– The flag value 0x04 is referred to as the "push-state" flag.

7.2.1 Creating new state in push mode

In push mode, the DEC install message is used by the PD-PE to create a request state.

The PD-PE sends a DEC install message with the decision flag set to push-state and the client handle set to "remote" to the PE-PE. When the PE-PE receives the DEC message, it associates a request state with the client handle value in the DEC message as if it had explicitly sent an REQ message using that client handle value, although it had never sent that REQ message at all. The client handle in the DEC install message shall use a new value in the PD-PE. It may reuse a value which was active in the past, but has been explicitly removed. However, this usage is not recommended. An aging period, in the order of minutes, is recommended before reuse of a deactivated client handle value.

The DEC message containing the push-state flag may contain a named decision data object defining state to be associated with the given client handle value. The result of sending such a DEC message is equivalent to the result of sending a DEC message with request state set, receiving a REQ message with a new client handle value, and sending another DEC message to install the named decision data. The message sequence for creation of a new state in push mode is shown in Figure 7-1.
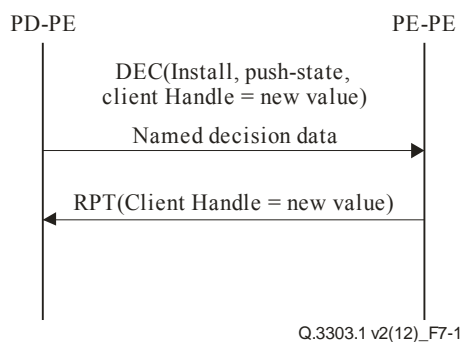
Figure 7-1 – Message sequences for creation of new state in push mode

7.2.2 Delete state in push mode

In push mode, the DEC remove message is used by the PD-PE to delete a request state.

A DEC remove message with the decision flag set to push-state and a client handle value which is originally created by the PD-PE, commands the PE-PE to delete the state as identified by the client handle value. The PE-PE deletes the associated state and sends a RPT message to the PD-PE with the result of the operation. Upon receipt a DEC remove message with the decision flag set to push-state and a client handle value which is new or was originally created by itself, the PE-PE should report an error.

The message sequence for deletion of a state in push mode is shown in Figure 7-2.
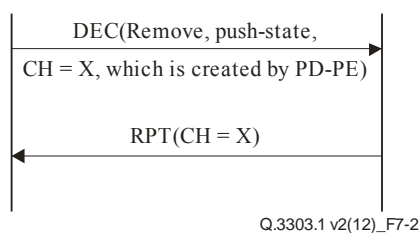
Figure 7-2 – Message sequences for delete state in push mode

7.2.3   Client handle collision solution

To avoid possible collisions between the client handle values allocated, by the PE-PE in pull mode and the PD-PE in push mode, it is recommended that all the client handle values allocated by the PD-PE be a sequence of complete client handle values containing a prefix. The prefix can be pre-configured by network operators or allocated dynamically by the PE-PE through message exchanges.

When using pre-configuration, the network operator may pre-configure the identifiers such as IP address, hostname, or domain name of the PD-PE and PE-PE, as the prefix of their allocated client handle values.

When using dynamic allocation, the PD-PE can request a prefix from the PE-PE. A DEC install message, with the request-prefix flag set in the COPS Decision Flags object, will cause the PE-PE to issue a new REQ message with a new client handle, in the same way it responds to a request-state flag (see clause 3.2 in [IETF RFC 3084]). However, the client handle is actually a prefix, which the PD-PE may use to generate a sequence of complete client handle values that are guaranteed to be unique to the PE-PE.
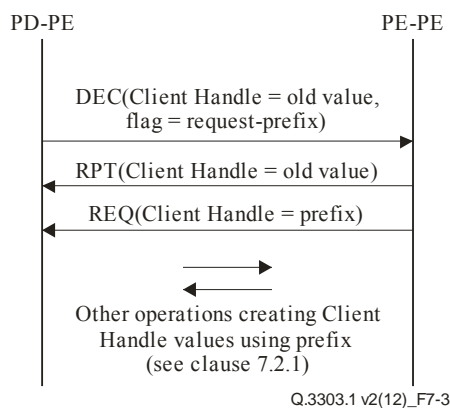
Q.3303.1 v2(12)_F7-3

Figure 7-3 – Messages exchanged to create and delete a client handle prefix

The complete sequence of messages exchanged during the life cycle of a sequence is shown in Figure 7-3. The initial DEC message requesting the prefix uses a client handle value created by an earlier REQ message (e.g., during session start-up). As always in COPS, the PE-PE first returns a RPT message in response to the DEC message, using the earlier client handle value. The PE-PE then sends an REQ message with the desired prefix value. The PD-PE creates a new state associated with the client handle value equal to the prefix value concatenated with some sequence of octets xyz, in the manner described in clause 7.2.1.

7.3   COPS basic message

All message formats specified in [IETF RFC 3084] are to be applied at the Rw interface. The client open, client accept, client close, keep alive, synchronize state request and synchronize state complete messages are used for setting up the connection, maintaining the connection, and synchronization of the request state between the PD-PE and the PE-PE.

The request (REQ), delete request state (DRQ), decision install (DEC install) and decision remove (DEC remove), and the RPT messages, supported by the COPS layer for Rw interface, are used for policy control operations.

8 Rw message description

8.1 Request (REQ PE-PE→PD-PE)

The REQ message is sent by the PE-PE to the PD-PE to request a configuration decision.

During state synchronization, the REQ message is generated and sent by the PE-PE to the PD-PE after receiving a synchronize state request (SSQ) message from the PD-PE. See clause 3.1 of [IETF RFC 3084].

The PE-PE may send information such as the physical or logical connection (or both) of the access transport network to which the CPE is attached (e.g., IP and MAC address of the CPE, User Id, and other physical information) in order to assist the PD-PE in deciding what types of policy the PE-PE shall install and enforce. The information is described in the RwReqInfoGroup in ITU-T Rw PIB and is carried in the named clientSI object of the REQ message.

8.2 Decision (DEC PD-PE→PE-PE)

The PD-PE pushes the final admission decisions to the PE-PE and requests NAT information or query event notification from the PE-PE using the install operation.

This information is carried in the named decision data object and is described by the following PRCs:

Flow-based policy:

The RwFlowbasedDecInfoGroup together with RwNatActionGroup, RwAppChrgInfoGroup, RwEventIndicatorGroup and RwFlowDescGroup are used for this purpose and include the following information:

– Resource request priority: described by the RwFlowBasedDecInfoRequestPriority attribute.

– Type of NAT: described by the RwFlowBasedDecInfoNatAction attribute.

– Charging ID of application layer: described by the RwFlowBasedDecAppChrgIds attribute.

– Event notification indication: described by the RwFlowBasedDecInfoEventIndicator attribute.

– Description of groups of the media flow within a session: described by the RwFlowBasedDecInfoFlowDesc attribute.

The individual media flow is described by RwFlowDescGroup together with RwFlowFirewallModeIndicationGroup, RwSingleFlowInfoGroup, RwFlowDirDescGroup, RwFlowInfoGroup, RwFilterGroup, RwFluxInfoGroup, RwVSWITCHFluxInfoGroup, RwMPLSConnectInfoGroup, RwMPLSLabelGroup, RwVSWITCHConnectInfoGroup, RwFlowTerminationGroup, RwFlowAddressRealmGroup and RwFlowLatchingIndicationGroup, including the following information:

– Flow ID: described by the RwSingleFlowInfoFlowId attribute.

– Dynamic firewall working mode: described by the RwSingleFlowInfoFirewallmodeIndication attribute.

– Flow information such as flow direction, the standard 5-tuple, gate status and service type: described by the RwFlowInfoGroup.

– Bandwidth and traffic descriptor (uplink and/or downlink): described by the RwFlowDirDescFluxInfo attribute.

– Path selection information (such as LSP or VLANId): described by the RwFlowDescConnectInfo attribute.

The PE-PE can create and store the bindings of media flow and path selection information in order to route media flows.

When the PD-PE requests the PE-PE to implement NAT for the groups of media flow, the control information may include:

– Termination indicator: indicating which side a media flow is terminated (access or core network) for the PE-PE, and is described by the RwSingleFlowInfoFlowTermination attribute.

– Address realm: described by the RwSingleFlowInfoAddressRealm attribute.

– Latching Indication: described by the RwSingleFlowInfoLatchingIndication attribute.

User-based policy:

The RwUserBasedDecInfoGroup together with the RwNetworkClassGroup and the RwDirFluxGroup are used for this purpose and includes the following information:

– User identifier: described by the RwUserBasedDecInfoUserId attribute;

– Network class of service: described by the RwUserBasedDecInfoNetworkClass attribute;

– Bandwidth and traffic descriptor (uplink and/or downlink): described by the RwDirFluxGroup.

In push mode, the RwDecCapGroup is used for providing the following PD-PE capabilities and limitations in the configuration DEC message:

– Indication of the maximum number of flow identifiers:

The PD-PE may notify the PE-PE how many flow identifiers the PD-PE is able to send with an install DEC message.

– Indication of the maximum number of application charging identifiers:

The PD-PE may notify the PE-PE how many applications charging IDs the PD-PE is able to send with a DEC install message.

The PD-PE can also request the PE-PE to delete an existing request state in the manner described in clause 7.3 when the request state is originally created by PD-PE, or in the manner described in clause 3.2 of [IETF RFC3084] when the request state is originally created by the PE-PE.

8.3   Report state (RPT PE-PE→ PD-PE)

The RPT message is used to report processing results or resource status from the PE-PE to the PD-PE. After the PE-PE finishes processing service messages, the result will be reported to the PD-PE. There are two scenarios related to the sending of an RPT message: The first is a response to any kind of DEC message (such as install and remove); the second is an unsolicited report to the PD-PE when the PE-PE detects an event which requires notification to the PD-PE. A flag in the RPT message header will be set to 1 and 0, respectively.

The information is carried in the named clientSI object and is described by the following PRCs:

NAT response:

The RwStateReportGroup together with RwFlowDescGroup, RwSingleFlowInfoGroup, RwFlowTerminationGroup, RwFlowAddressRealmGroup, RwFlowDirDescGroup, RwFlowInfoGroup and RwFilterGroup is used for NAT response.

Named clientSI object will contain one or more GPERR object, ErrorPRID object, CPERR object, PRID and EPD object.

Bearer charging ID:

The RwStateReportGroup together with RwRprtBearChrgInfoGroup are used to provide bearer charging information.

Event notification:

The RwStateReportGroup together with RwEventIndicatorGroup are used to provide event notification to the PD-PE.

This Recommendation requires that the standard COPS-PR error handling mechanism and error objects, such as GPERR object, ErrorPRID object and CPERR object be applied.

8.4 Delete request state (DRQ PE-PE→ PD-PE)

The PE-PE informs the PD-PE via a DRQ message that the state identified by the client handle is no longer available and shall be removed by the PD-PE.

The DRQ message includes the reason why the request state was deleted.

9 COPS parameters reused

9.1 Client handle

When a new request state is created (user requests online or the PD-PE installs a configuration for a user in push mode), either the PE-PE or the PD-PE allocates a new client handle value for that request state and ensures its uniqueness in a COPS connection. It is carried in a client handle object, uniquely identifying one request state and then used by subsequent REQ, DEC, and RPT messages to reference the same user's request state. In subsequent service handling, users exchange information with the same client handle value. When the user service is finished, the user will delete the client handle.

During the synchronization process no new client handles are allocated, however existing client handles are used.

9.2 Flow ID

Flow ID is used to identify the media flow within a session. Each session may contain multiple media flows, and each media flow is identified by a unique flow ID. Usually flow IDs are created by the PD-PEs.

9.3 Flow information

Flow information is included in DEC install messages and includes the following information:
– Direction
– Filter
  • Address type
  • IP addresses
  • Ports
  • Protocol number
  • DSCP
– Filter status
– Service type.

9.4 Traffic information

Traffic information is included in DEC install messages. The characteristics of the traffic information include the following and shall also address the uplink traffic information and the downlink traffic information:
– Bandwidth unit

–   Peak bandwidth

–   Average bandwidth

–   Max package length.

The following traffic information may also be provided when the bearer network employs Non-MPLS technology:

–   Direction

–   Base traffic information

–   Flow priority

–   CAR flag

–   Broadcast bate flag

–   Path backup flag.

9.5   Connection information

The connection information is included in the installation information. Since the network employs different technologies, it may have different descriptions depending on the technology employed.

9.5.1   Bearer network employing MPLS technology

MPLS based networks include the following installation information:

–   Maximum transport unit in the path

–   Label stack (Maximum with 16 labels).

9.5.2   Bearer network employing Non-MPLS technology

Non-MPLS based networks that use the Diffserv model of QoS, such as LAN and IP, include the following installation information:

–   Source interface address information

–   Source VlanID

–   Source VlanID QinQ

–   Destination interface address information

–   DestinationVlanID

–   Destination VlanID QinQ.

10   Application of PIB

10.1   Role of PIB

PIB provides a solution to interworking between different production vendors. PIB defines a collection of PRCs that can be accessed by COPS and provides the data instances (PRIs) for any given data structure (PRC). Instances of the provisioning classes are each identified by a PRID in the PIB. Thus, the PIB is similar to a virtual database of the PRC.

A PIB is defined and it inherits part of its data definitions from other PIBs, including the PIBs defined in [IETF RFC 3159], [IETF RFC 4001] and [IETF RFC 3318].

10.2   Encoding of PIB

Adopt ASN.1 BER to encode the PRID and policy data as described in clause 2.2.1 in [IETF RFC 3084].

10.3   Definition of PIB

PIB is based on the IP network of QoS guaranteed. See Annex A for detailed information.

11   Security considerations

The security mechanisms described in COPS [IETF RFC 2748] and COPS-PR [IETF RFC 3084] should be reused in this Recommendation.

Annex A

Rw policy information base

(This annex forms an integral part of this Recommendation.)

```
ITUT-RwPib PIB-DEFINITIONS ::= BEGIN
IMPORTS
        Unsigned32,
       Integer32,
       MODULE-IDENTITY,
        MODULE-COMPLIANCE,
       OBJECT-TYPE,
       OBJECT-GROUP
FROM COPS-PR-SPPI -- Defined in RFC 3159

        InstanceId,
       Prid
FROM COPS-PR-SPPI-TC -- Defined in RFC 3159

        DscpOrAny
FROM DIFFSERV-DSCP-TC -- Defined in RFC 3289

        zeroDotZero
FROM SNMPv2-SMI

        InetAddress,
InetAddressType,
       InetAddressPrefixLength,
       InetPortNumber
FROM INET-ADDRESS-MIB;  -- Defined in RFC 4001


iTUT-RwPib MODULE-IDENTITY
       SUBJECT-CATEGORIES     { Rw(0x800c) } -- ITU-T Rw COPS Client Type
       LAST-UPDATED "201206130000Z"
       ORGANIZATION "ITU-T Study Group 11"
       CONTACT-INFO "huanghexian@ ritt.cn"
       DESCRIPTION
           "A PIB module containing the set of provisioning
           classes that are required for support of policies for
           RW Cops interface"
       REVISION "200511100000Z"
       DESCRIPTION
           "The ITU-T RW PIB for Rec. Q.3303.1 version 2"
::= { 0.0.17.3303.127.1.2.1 }
-- itu-t(0) recommendation(0) q(17) q3303(3303) hyphen(127) <...>(1) ??pib(2)
version2 (1).

--
-- The root OID for PRCs in the ITU-T Rw PIB
--

rwCapabilityClasses          OBJECT IDENTIFIER ::= { iTUT-RwPib 1}
rwEventInfoClasses           OBJECT IDENTIFIER ::= { iTUT-RwPib 2}
rwServiceInfoClasses         OBJECT IDENTIFIER ::= { iTUT-RwPib 3}
rwReqInfoClasses        OBJECT IDENTIFIER ::= { iTUT-RwPib 4}
rwDecInfoClasses        OBJECT IDENTIFIER ::= { iTUT-RwPib 5}
rwReportClasses         OBJECT IDENTIFIER ::= { iTUT-RwPib 6}
rwConformance      OBJECT IDENTIFIER ::= { iTUT-RwPib 7}


---------------------------------------------------------------------------
-- Capability and Limitation Policy Rule Classes
```

```
-- Rw Decision Capability Table
--
rwDecCapTable OBJECT-TYPE
       SYNTAX SEQUENCE OF RwDecCapEntry
       PIB-ACCESS notify
       STATUS current
       DESCRIPTION
          "PRC from PD-PE to PE-PE carried by DEC during initial capability
negotiation, indicating the PD-PE's capability."
::= { rwCapabilityClasses 1 }

rwDecCapEntry OBJECT-TYPE
       SYNTAX RwDecCapEntry
       STATUS current
       DESCRIPTION
          "An instance of the RwDecCap class identifies a specific PRC and
associated attributes as supported by the device."
       PIB-INDEX { RwDecCapPrid }
       UNIQUENESS { }
::= { rwDecCapTable 1 }

RwDecCapEntry ::= SEQUENCE {
          rwDecCapPrid        InstanceId,
          rwDecCapAppChrgIds  Unsigned32,
          rwDecCapFlowIds         Unsigned32
       }

rwDecCapPrid OBJECT-TYPE
       SYNTAX InstanceId
       STATUS current
       DESCRIPTION
          "An arbitrary integer index that uniquely identifies an
          instance of the RwDecCap class."
::= { rwDecCapEntry 1 }

rwDecCapAppChrgIds OBJECT-TYPE
       SYNTAX Unsigned32
       STATUS current
       DESCRIPTION
          "Indication of the maximum number of Application Charging Id possible
in a single Dec message.
          The value of zero indicates limit is not specified."
       DEFVAL { 0 }
::= { rwDecCapEntry 2 }

rwDecCapFlowIds OBJECT-TYPE
       SYNTAX Unsigned32
       STATUS current
       DESCRIPTION
          "Indication of the maximum number of Flow Id possible in a single Dec
message.
          The value of zero indicates limit is not specified."
       DEFVAL { 0 }
::= { rwDecCapEntry 3 }

-----------------------------------------------------------------------------

-- Rw Decision Capability Acknowledge Table
--
rwDecCapACKTable OBJECT-TYPE
       SYNTAX SEQUENCE OF RwDecCapACKEntry
       PIB-ACCESS install
       STATUS current
```

```
          DESCRIPTION
              "PRC from PD-PE to PE-PE carried by COPS-PR RPT messages indicating
the result of the capability negotiation."
::= { rwCapabilityClasses 2 }


rwDecCapACKEntry OBJECT-TYPE
        SYNTAX RwDecCapACKEntry
        STATUS current
        DESCRIPTION
            "An instance of the RwDecCapACK class sent by the PE-PE to the PD-PE."
        PIB-INDEX { RwDecCapACKPrid }
        UNIQUENESS { }
::= { rwDecCapACKTable 1 }


RwDecCapACKEntry ::= SEQUENCE {
        rwDecCapACKPrid         InstanceId,
        rwDecCapACKEnable INTEGER,
        rwDecCapACKChrgIds      Unsigned32,
        rwDecCapACKFlowIds      Unsigned32
        }


rwDecCapACKPrid OBJECT-TYPE
        SYNTAX InstanceId
        STATUS current
        DESCRIPTION
            "An arbitrary integer index that uniquely identifies an instance of
this class."
::= { rwDecCapACKEntry 1 }


rwDecCapACKEnable OBJECT-TYPE
        SYNTAX INTEGER {
                    enable(1),
                    disable(2)
                }
        STATUS current
        DESCRIPTION
            "Controls the usage of PD-PE capability negotiation."
        DEFVAL { enable }
::= { rwDecCapACKEntry 2 }


rwDecCapACKChrgIds OBJECT-TYPE
        SYNTAX Unsigned32
        STATUS current
        DESCRIPTION
        "Indication of the maximum number of Application Charging Id in a DEC
message which is acceptable to PE-PE.
            The value of zero indicates limit is not specified."
        DEFVAL { 0 }
::= { rwDecCapACKEntry 3 }


rwDecCapACKFlowIds OBJECT-TYPE
        SYNTAX Unsigned32
        STATUS current
        DESCRIPTION
        "Indication of the maximum number of Flow Id in a DEC message which is
acceptable to PE-PE.
            The value of zero indicates limit is not specified."

        DEFVAL { 0 }
::= { rwDecCapACKEntry 4 }


----------------------------------------------------------------------
--
--Rw Event Info Classes
```

```
--
--Rw Event Notification Indication Table

rwEventIndicatorTable OBJECT-TYPE
        SYNTAX SEQUENCE OF RwEventIndicatorEntry
        PIB-ACCESS install-notify
        STATUS current
        DESCRIPTION
            "PRC representing event notification indicator. In COPS-PR install
decision object and sent by PD-PE to PE-PE indicate the PD-PE requests the PE-PE
to provide a notification at the transport event. In PRT message and sent by
PE-PE to PD-PE indicate the PE-PE report the transport event to PD-PE."
::= { rwEventInfoClasses 1 }

rwEventIndicatorEntry OBJECT-TYPE
        SYNTAX RwEventIndicatorEntry
        STATUS current
        DESCRIPTION
            "An entry in the Event Indicator Table describing a transport event.
            Each entry is referenced by RwDecInfoEventIndicator."
        PIB-INDEX { RwEventIndicatorPrid }
        UNIQUENESS { }
::= { rwEventIndicatorTable 1 }

RwEventIndicatorEntry ::= SEQUENCE {
            rwEventIndicatorPridInstanceId,
            rwEventIndicator         Integer32,
            rwEventIndicatornextPrid
        }

rwEventIndicatorPrid OBJECT-TYPE
        SYNTAX InstanceId
        STATUS current
        DESCRIPTION
            "An arbitrary integer index that uniquely identifies an
            instance of the RwEventIndicator class."
::= { rwEventIndicatorEntry 1 }

rwEventIndicator OBJECT-TYPE
        SYNTAX Integer32{
                    chargingCorrelationExchange (1),
                    indicationOfLossOfBearer(2),
                    indicationOfRecoveryOfBearer(3),
                    indicationOfReleaseOfBearer(4),
                    deviceoverload (5),
                    devicerecoverfromoverload(6)
                    }
        STATUS current
        DESCRIPTION
            "an integer indicating the query and notification of a transport
event."
::= { rwEventIndicatorEntry 2 }

rwEventIndicatornext OBJECT-TYPE
        SYNTAX Prid
        STATUS current
        DESCRIPTION
            "References the next of a list of RwEventIndicator instances. A value
of zeroDotZero indicates this is the last of a list RwEventIndicator instances."
        DEFVAL { zeroDotZero }
::= { rwEventIndicatorEntry 3 }

------------------------------------------------------------------
```

```
--Rw Service Info Classes

--
-- RW Flow Desc Table
--
rwFlowDescTable OBJECT-TYPE
       SYNTAX SEQUENCE OF RwFlowDescEntry
       PIB-ACCESS  install-notify
       STATUS current
       DESCRIPTION
           "PRC representing the information of flows involved in a session.
           Referenced by the RwFlowBasedDecInfoFlowDesc and RwFlowDescNext."
::= { rwServiceInfoClasses 1 }

rwFlowDescEntry OBJECT-TYPE
       SYNTAX RwFlowDescEntry
       STATUS current
       DESCRIPTION
           "An entry in the Flow Desc Table describing the information of a list
flows.
           It is referenced by RwFlowBasedDecInfoFlowDesc and RwFlowDescNext. It
may be carried by COPS-PR Install decision from PD-PE to PE-PE,or by COPS-PR RPT
responding to the NAT request from PD-PE."
       PIB-INDEX { RwFlowDescPrid }
       UNIQUENESS { }
::= { rwFlowDescTable 1 }

RwFlowDescEntry ::= SEQUENCE {
        rwFlowDescPrid                  InstanceId,
        rwFlowDescSingleFlowInfo        Prid,
        rwFlowDescConnectInfo           Prid,
        rwFlowDescNext                  Prid

        }

rwFlowDescPrid OBJECT-TYPE
       SYNTAX InstanceId
       STATUS current
       DESCRIPTION
           "An arbitrary integer index that uniquely identifies an instance of
the RwFlowDesc class."
::= { rwFlowDescEntry 1 }

rwFlowDescSingleFlowInfo OBJECT-TYPE
       SYNTAX Prid
       STATUS current
       DESCRIPTION
           "An arbitrary integer index that references the first of a list of
RwSingleFlowInfo Instances. In COPS-PR install decision and RPT of responding to
the NAT request from PD-PE. There is at least one RwSingleFlowDesc Instance in
the COPS-PR install decision."
::= { rwFlowDescEntry 2 }

rwFlowDescConnectInfo OBJECT-TYPE
       SYNTAX Prid
       STATUS current
       DESCRIPTION
           "An arbitrary integer index that uniquely identifies
           an instance of the RwMPLSConnectionInfo or RwVSWITCHConnectInfo. A
value of zeroDotZero indicates there are no Flow Connection Information
included. It is not required in the COPS-PR RPT message responding to the NAT
request from PD-PE."
       DEFVAL { zeroDotZero }
::= { rwFlowDescEntry 3 }
```

```
rwFlowDescNext OBJECT-TYPE
        SYNTAX Prid
        STATUS current
        DESCRIPTION
            "References the next of a list of RwFlowDesc instances. A value of
zeroDotZero indicates this is the last of a list RwFlowDesc instances."
        DEFVAL { zeroDotZero }
::= { rwFlowDescEntry 4 }

--------------------------------------------------------------------------------

--
-- Rw Single Flow Info Table
--

rwSingleFlowInfoTable OBJECT-TYPE
        SYNTAX SEQUENCE OF RwSingleFlowInfoEntry
        PIB-ACCESS install-notify
        STATUS current
        DESCRIPTION
            "PRC representing the information of flow, which is identified with a
Flow ID."
::= { rwServiceInfoClasses 2 }

rwSingleFlowInfoEntry OBJECT-TYPE
        SYNTAX RwSingleFlowInfoEntry
        STATUS current
        DESCRIPTION
            "An entry in the Single Flow Info Table describing the information of
a flow.
            It is referenced by RwFlowDescSingleFlowInfo. There should be two
entries when the NAT is implementated, one for the access side flow and the
other for core side flow. Otherwise one entry for each flow."
        PIB-INDEX { RwSingleFlowInfoPrid }
        UNIQUENESS { }
::= { rwSingleFlowInfoTable 1 }

RwSingleFlowInfoEntry ::= SEQUENCE {
            rwSingleFlowInfoPrid                    InstanceId,
            rwSingleFlowInfoFlowId                  Integer32,
            rwSingleFlowInfoFlowTermination         Prid,
            rwSingleFlowInfoAddressRealm            Prid,
            rwSingleFlowInfoLatchingIndication      Prid,
            rwSingleFlowInfoFirewallModeIndicationPrid,
            rwSingleFlowInfoFlowDirDesc             Prid
        }

rwSingleFlowInfoPrid OBJECT-TYPE
        SYNTAX InstanceId
        STATUS current
        DESCRIPTION
            "An arbitrary integer index that uniquely identifies an
            instance of the RwSingleFlowInfo entry."
::= { rwSingleFlowInfoEntry 1 }

rwSingleFlowInfoFlowId OBJECT-TYPE
        SYNTAX Integer32
        STATUS current
        DESCRIPTION
            "The FlowId itself."
::= { rwSingleFlowInfoEntry 2 }

rwSingleFlowInfoFlowTermination OBJECT-TYPE
```

```
        SYNTAX Prid
        STATUS current
        DESCRIPTION
        "An arbitrary integer index that uniquely identifies an instance of
RwFlowTermination. A value of zeroDotZero indicates there are no NAT
implementation in the PE-PE."
        DEFVAL { zeroDotZero }
::= { rwSingleFlowInfoEntry 3 }

rwSingleFlowInfoAddressRealm OBJECT-TYPE
        SYNTAX Prid
        STATUS current
        DESCRIPTION
            "An arbitrary integer index that uniquely identifies an instance of
RwFlowAddressRealm. A value of zeroDotZero indicates there are no Address Realm
information associated with this Single Flow Info."
        DEFVAL { zeroDotZero }
::= { rwSingleFlowInfoEntry 4 }

rwSingleFlowInfoLatchingIndication OBJECT-TYPE
        SYNTAX Prid
        STATUS current
        DESCRIPTION
            "An arbitrary integer index that uniquely identifies an instance of
RwFlowLatchingIndication. A value of zeroDotZero indicates there are no Latching
Indication information associated with this Single Flow Info."
        DEFVAL { zeroDotZero }
::= { rwSingleFlowInfoEntry 5 }

rwSingleFlowInfoFirewallModeIndication OBJECT-TYPE
        SYNTAX Prid
        STATUS current
        DESCRIPTION
            "An arbitrary integer index that uniquely identifies an instance of
RwFlowFirewallModeIndication. A value of zeroDotZero indicates the default
firewall working mode will be applied."
        DEFVAL { zeroDotZero }
::= { rwSingleFlowInfoEntry 6 }

rwSingleFlowInfoFlowDirDesc OBJECT-TYPE
        SYNTAX Prid
        STATUS current
        DESCRIPTION
            "References the first of a list of RwFlowDirDesc associated with this
instance of Single Flow Info. There is one RwFlowDirDesc instance per
direction(uplink or downlink)."
::= { rwSingleFlowInfoEntry 7 }

--------------------------------------------------------------
--
-- Rw Flow Termination Table
--

rwFlowTerminationTable OBJECT-TYPE
        SYNTAX SEQUENCE OF RwFlowTerminationEntry
        PIB-ACCESS  install-notify
        STATUS current
        DESCRIPTION
            "PRC representing the side(access or core network) of the flow, which
is identified with a Flow ID."
::= { rwServiceInfoClasses 3 }

rwFlowTerminationEntry OBJECT-TYPE
        SYNTAX RwFlowTerminationEntry
```

```
        STATUS  current
        DESCRIPTION
            "An  entry  in  the  Flow  Termination  Table  describing  the  side
information of a flow.
            It is referenced by RwSingleFlowInfoFlowTermination."
        PIB-INDEX { RwFlowTerminationPrid }
        UNIQUENESS { }
::= { rwFlowTerminationTable 1 }

RwFlowTerminationEntry ::= SEQUENCE {
        rwFlowTerminationPrid              InstanceId,
        rwFlowTermination                 Integer32,
        }

rwFlowTerminationPrid OBJECT-TYPE
        SYNTAX InstanceId
        STATUS current
        DESCRIPTION
            "An  arbitrary  integer  index  that  uniquely  identifies  an  instance  of
the RwFlowTermination entry."
::= { rwFlowTerminationEntry 1 }

rwFlowTermination OBJECT-TYPE
        SYNTAX Integer32{
                access (0),
                core (1) }
        STATUS current
        DESCRIPTION
            "an integer indicating the side of the flow is terminated."
::= { rwFlowTerminationEntry 2 }

-------------------------------------------------------------------------
--
--Rw Flow Address Realm Table
--

rwFlowAddressRealmTable OBJECT-TYPE
        SYNTAX SEQUENCE OF RwFlowAddressRealmEntry
        PIB-ACCESS  install
        STATUS current
        DESCRIPTION
            "PRC representing the address realm of the flow's IP address."
::= { rwServiceInfoClasses 4 }

rwFlowAddressRealmEntry OBJECT-TYPE
        SYNTAX RwFlowAddressRealmEntry
        STATUS current
        DESCRIPTION
            " An  entry  in  the  Flow  Address  Realm  Table  describing  the  realm
information of a flow's source and destination address.
            It is referenced by RwSingleFlowInfoAddressRealm."
        PIB-INDEX { RwFlowAddressRealmPrid }
        UNIQUENESS { }
::= { rwFlowAddressRealmTable 1 }

RwFlowAddressRealmEntry ::= SEQUENCE {
        rwFlowAddressRealmPrid                InstanceId,
        rwFlowAddressRealm  OCTET STRING,
        }

rwFlowAddressRealmPrid OBJECT-TYPE
        SYNTAX InstanceId
        STATUS current
        DESCRIPTION
```

```
                "An arbitrary integer index that uniquely identifies an
                instance of the RwFlowAddressRealm entry."
::= { rwFlowAddressRealmEntry 1 }


rwFlowAddressRealm OBJECT-TYPE
        SYNTAX OCTET STRING
        STATUS current
        DESCRIPTION
            " indicate the address realm of the flow's source and destination
address."
::= { rwFlowAddressRealmEntry 2 }


--------------------------------------------------------------------------------
--
--Rw Flow Latching Indication Table
--

rwFlowLatchingIndicationTable OBJECT-TYPE
        SYNTAX SEQUENCE OF RwFlowLatchingIndicationEntry
        PIB-ACCESS  install
        STATUS current
        DESCRIPTION
            "PRC representing the latching indication of the flow, which is
identified with a Flow ID."
::= { rwServiceInfoClasses 5 }


rwFlowLatchingIndicationEntry OBJECT-TYPE
        SYNTAX RwFlowLatchingIndicationEntry
        STATUS current
        DESCRIPTION
            " An entry in the Flow Latching Indication Table describing the
latching information of a flow.
             It is referenced by RwSingleFlowInfoLatchingIndication."
        PIB-INDEX { RwFlowLatchingIndicationPrid }
        UNIQUENESS { }
::= { rwFlowLatchingIndicationTable 1 }

RwFlowLatchingIndicationEntry ::= SEQUENCE {
        rwFlowLatchingIndicationPrid                    InstanceId,
        rwFlowLatchingIndication  Integer32,
        }

rwFlowLatchingIndicationPrid OBJECT-TYPE
        SYNTAX InstanceId
        STATUS current
        DESCRIPTION
            "An arbitrary integer index that uniquely identifies an
            instance of the RwFlowLatchingIndication entry."
::= { rwFlowLatchingIndicationEntry 1 }

rwFlowLatchingIndication OBJECT-TYPE
        SYNTAX Integer32{
                    latching(0),
                    relatching(1) }
        STATUS current
        DESCRIPTION
            " indicate the latch action of the flow in the PE-PE."
::= { rwFlowLatchingIndicationEntry 2 }

--------------------------------------------------------------------------
-- Rw Flow Firewall working mode Indication Table
--
rwFlowFirewallModeIndicationTable OBJECT-TYPE
        SYNTAX SEQUENCE OF RwFlowFirewallModeIndicationEntry
```

```
        PIB-ACCESS install
        STATUS current
        DESCRIPTION
            "PRC representing the latching indication of the flow, which is
identified with a Flow ID."
::= { rwServiceInfoClasses 6}


rwFlowFirewallModeIndicationEntry OBJECT-TYPE
        SYNTAX RwFlowFirewallModeIndicationEntry
        STATUS current
        DESCRIPTION
            " An entry in the Flow Firewall Mode Indication Table describing the
information for dynamic firewall working mode selection.
            It is referenced by RwSingleFlowInfoFirewallModeIndication."
        PIB-INDEX { RwFlowFirewallModeIndicationPrid }
        UNIQUENESS { }
::= { rwFlowFirewallModeIndicationTable 1 }


RwFlowFirewallModeIndicationEntry ::= SEQUENCE {
        rwFlowFirewallModeIndicationPridInstanceId,
        rwFlowFirewallModeIndication        Integer32
        }


rwFlowFirewallModeIndicationPrid OBJECT-TYPE
        SYNTAX InstanceId
        STATUS current
        DESCRIPTION
            "An arbitrary integer index that uniquely identifies an
            instance of the RwFlowFirewallModeIndication entry."
::= { rwFlowFirewallModeIndicationEntry 1 }


rwFlowFirewallModeIndication OBJECT-TYPE
        SYNTAX Integer32{
                    staticPacketFiltering (0),
                    dynamicPacketFiltering (1),
                    statefulInspection(2),
                    deepPacketInspection(3) }
        STATUS current
        DESCRIPTION
            " indicate the information for dynamic firewall working mode
selection."
        DEFVAL { 0 }
::= { rwFlowFirewallModeIndicationEntry 2 }



-------------------------------------------------------------------
--
-- Rw Flow Direction Description Table
--

rwFlowDirDescTable OBJECT-TYPE
        SYNTAX SEQUENCE OF RwFlowDirDescEntry
        PIB-ACCESS install
        STATUS current
        DESCRIPTION
            "PRC representing the information of flow in the direction of uplink
and/or downlink."
::= { rwServiceInfoClasses 7}


rwFlowDirDescEntry OBJECT-TYPE
        SYNTAX RwFlowDirDescEntry
        STATUS current
        DESCRIPTION
```

```
            " An entry in the Flow Dec Table describing the information of a flow.
            It    is    referenced    by    RwSingleFlowInfoFlowDirDesc    and
RwFlowDirDescNext."
        PIB-INDEX { RwFlowDirDescPrid }
        UNIQUENESS { }
::= { rwFlowDirDescTable 1 }


RwFlowDirDescEntry ::= SEQUENCE {
        rwFlowDirDescPrid          InstanceId,
        rwFlowDirDescInfo          Prid,
        rwFlowDirDescFluxInfo      Prid,
        rwFlowDirDescNext          Prid
        }


rwFlowDirDescPrid OBJECT-TYPE
        SYNTAX InstanceId
        STATUS current
        DESCRIPTION
            "An arbitrary integer index that uniquely identifies an
            instance of the RwFlowDirDesc entry."
::= { rwFlowDirDescEntry 1 }


rwFlowDirDescInfo OBJECT-TYPE
        SYNTAX Prid
        STATUS current
        DESCRIPTION
            "An arbitrary integer index that references the RwFlowInfo Instances."
::= { rwFlowDirDescEntry 2 }


rwFlowDirDescFluxInfo OBJECT-TYPE
        SYNTAX Prid
        STATUS current
        DESCRIPTION
            "An arbitrary integer index that references the RwFluxInfo Instances."
::= { rwFlowDirDescEntry 3 }


rwFlowDirDescNext OBJECT-TYPE
        SYNTAX Prid
        STATUS current
        DESCRIPTION
            " References the next of a list of RwFlowDirDesc instances. A value of
zeroDotZero indicates this is the last of a list RwFlowDirDesc instances."
        DEFVAL { zeroDotZero }
::= { rwFlowDirDescEntry 4 }



---------------------------------------------------------------------
--
-- Rw FlowInfo Table
--

rwFlowInfoTable OBJECT-TYPE
        SYNTAX SEQUENCE OF RwFlowInfoEntry
        PIB-ACCESS  install
        STATUS current
        DESCRIPTION
            " PRC representing the information of flow in the direction of uplink
or ownlink."
::= { rwServiceInfoClasses 8 }


rwFlowInfoEntry OBJECT-TYPE
        SYNTAX RwFlowInfoEntry
        STATUS current
        DESCRIPTION
```

```
                " An entry in the Flow Info Table describing the information of a flow
in the direction of uplink or downlink.
                It is referenced by RwFlowDirDec."
         PIB-INDEX { RwFlowInfoPrid }
         UNIQUENESS { }
::= { rwFlowInfoTable 1 }


RwFlowInfoEntry ::= SEQUENCE {
         rwFlowInfoPrid               InstanceId,
         rwFlowInfoDirection          INTEGER,
         rwFlowInfoFilter             Prid,
         rwFlowInfoFilterStatus       INTEGER,
         rwFlowInfoServiceType        INTEGER
         }


rwFlowInfoPrid OBJECT-TYPE
         SYNTAX InstanceId
         STATUS current
         DESCRIPTION
             "An arbitrary integer index that uniquely identifies an
             instance of the RwFlowInfo."
::= { rwFlowInfoEntry 1 }


rwFlowInfoDirection OBJECT-TYPE
         SYNTAX INTEGER {
                     uplink  (1),
                     downlink     (2)
                 }
         STATUS current
         DESCRIPTION
             "Indicates the direction the flow."
::= { rwFlowInfoEntry 2 }


rwFlowInfoFilter OBJECT-TYPE          -- filter
         SYNTAX Prid
         STATUS current
         DESCRIPTION
             "References an entry of RwFilterTable
             that describes the applicable classification filter.
             A value of zeroDotZero indicates no filter is
             used with this RwFlowInfoTable."
::= { rwFlowInfoEntry 3 }


rwFlowInfoFilterStatus OBJECT-TYPE  --filter status
         SYNTAX INTEGER {
                     close(0),
                     open(1)
                 }
         STATUS current
         DESCRIPTION
             "Indicates if this gate will allow traffic to flow."
         DEFVAL { open }
::= { rwFlowInfoEntry 4 }


rwFlowInfoServiceType OBJECT-TYPE    --service type
         SYNTAX INTEGER {
                     audio(1),
                     video(2)
                 }
         STATUS current
         DESCRIPTION
             "service type"
::= { rwFlowInfoEntry 5 }
```

```
              ----------------------------------------------------------------

-- Rw Filter Table
--

rwFilterTable OBJECT-TYPE
        SYNTAX SEQUENCE OF RwFilterEntry
        PIB-ACCESS  install
        STATUS current
        DESCRIPTION
           "The Filter class. A packet has to match all fields in an Filter.
Wildcards may be specified for those fields that are not relevant."
::= { rwServiceInfoClasses 9 }

rwFilterEntry OBJECT-TYPE
        SYNTAX RwFilterEntry
        STATUS current
        DESCRIPTION
           " An entry in the Filter Table describing the information of a
filter."
        PIB-INDEX { RwFilterPrid }
        UNIQUENESS { }
::= { rwFilterTable 1 }

RwFilterEntry ::= SEQUENCE {
            rwFilterPrid              InstanceId,
            rwFilterDstAddrType       InetAddressType,
            rwFilterDstAddr                 InetAddress,
            rwFilterDstPrefixLength   InetAddressPrefixLength,
            rwFilterSrcAddrType       InetAddressType,
            rwFilterSrcAddr                 InetAddress,
            rwFilterSrcPrefixLength   InetAddressPrefixLength,
            rwFilterDscp              DscpOrAny,
            rwFilterProtocol                Unsigned32,
            rwFilterDstL4PortMin      InetPortNumber,
            rwFilterDstL4PortMax      InetPortNumber,
            rwFilterSrcL4PortMin      InetPortNumber,
            rwFilterSrcL4PortMax      InetPortNumber
        }

rwFilterPrid OBJECT-TYPE
        SYNTAX InstanceId
        STATUS current
        DESCRIPTION
           "An arbitrary integer index that uniquely identifies an
           instance of the Rw Filter class."
::= { rwFilterEntry 1 }

rwFilterDstAddrType OBJECT-TYPE
        SYNTAX InetAddressType
        STATUS current
        DESCRIPTION
           "The address type enumeration value to specify the type of
           the packet's destination IP address. "
        REFERENCE
           "Textual Conventions for Internet Network Addresses.
           RFC 4001."
::= { rwFilterEntry 2 }

rwFilterDstAddr OBJECT-TYPE
        SYNTAX InetAddress
        STATUS current
        DESCRIPTION
```

```
            "The IP address to match against the packet's destination IP address.
If the address type is 'ipv4',
            'ipv6', 'ipv4z' or 'ipv6z' then, the attribute RwFilterDstPrefixLength
indicates the number of bits
            that are relevant. "
        REFERENCE
            "Textual Conventions for Internet Network Addresses.
            RFC 4001."
::= { rwFilterEntry 3 }


rwFilterDstPrefixLength OBJECT-TYPE
        SYNTAX InetAddressPrefixLength
        STATUS current
        DESCRIPTION
            " The length of a mask for the matching of the destination
            IP address. This attribute is interpreted only if the
            InetAddressType is 'ipv4', 'ipv4z', 'ipv6' or 'ipv6z'.
            Masks are constructed by setting bits in sequence from the
            most-significant  bit   downwards   for   RwFilterDstPrefixLength   bits
length. All other bits in
            the mask, up to the number needed to fill the length of
            the address RwFilterDstAddr are cleared to zero. A zero
            bit in the mask then means that the corresponding bit in
            the address always matches.

            In IPv4 addresses, a length of 0 indicates a match of any
            address; a length of 32 indicates a match of a single host
            address, and a length between 0 and 32 indicates the use of
            a CIDR Prefix. IPv6 is similar, except that prefix lengths
            range from 0..128."
        REFERENCE
            "Textual Conventions for Internet Network Addresses.
            RFC 4001."
        DEFVAL { 0 }
::= { rwFilterEntry 4 }

rwFilterSrcAddrType OBJECT-TYPE
        SYNTAX InetAddressType
        STATUS current
        DESCRIPTION
            "The address type enumeration value to specify the type of
            the packet's source IP address. "
        REFERENCE
            "Textual Conventions for Internet Network Addresses.
            RFC 4001."
::= { rwFilterEntry 5 }

rwFilterSrcAddr OBJECT-TYPE
        SYNTAX InetAddress
        STATUS current
        DESCRIPTION
            "The IP address to match against the packet's source IP address. If
the address type is 'ipv4',
            'ipv6', 'ipv4z' or 'ipv6z' then, the attribute RwFilterSrcPrefixLength
indicates the number of bits
            that are relevant. "
        REFERENCE
            "Textual Conventions for Internet Network Addresses.
            RFC 4001."
::= { rwFilterEntry 6 }

rwFilterSrcPrefixLength OBJECT-TYPE
        SYNTAX InetAddressPrefixLength
```

```
        STATUS current
        DESCRIPTION
            " The length of a mask for the matching of the source
            IP address. This attribute is interpreted only if the
            InetAddressType is 'ipv4', 'ipv4z', 'ipv6' or 'ipv6z'.
            Masks are constructed by setting bits in sequence from the
            most-significant bit downwards for RwFilterSrcPrefixLength bits
            length. All other bits in
            the mask, up to the number needed to fill the length of
            the address RwFilterDstAddr are cleared to zero. A zero
            bit in the mask then means that the corresponding bit in
            the address always matches.

            In IPv4 addresses, a length of 0 indicates a match of any
            address; a length of 32 indicates a match of a single host
            address, and a length between 0 and 32 indicates the use of
            a CIDR Prefix. IPv6 is similar, except that prefix lengths
            range from 0..128."
        REFERENCE
            "Textual Conventions for Internet Network Addresses.
            RFC 4001."
        DEFVAL { 0 }
::= { rwFilterEntry 7 }

rwFilterDscp OBJECT-TYPE
        SYNTAX DscpOrAny
        STATUS current
        DESCRIPTION
            "The value that the DSCP in the packet can have and
            match this filter. A value of -1 indicates that a specific
            DSCP value has not been defined and thus all DSCP values
            are considered a match."
        REFERENCE
            "Management Information Base for the Differentiated Services
            Architecture. RFC 3289."
        DEFVAL { -1 }
::= { rwFilterEntry 8 }

rwFilterProtocol OBJECT-TYPE
        SYNTAX Unsigned32 (0..255)
        STATUS current
        DESCRIPTION
            "The layer-4 protocol Id to match against the IPv4 protocol
            number or the IPv6 Next-Header number in the packet. A value
            of 255 means match all. Note the protocol number of 255 is
            reserved by IANA, and Next-Header number of 0 is used in
            IPv6."
        DEFVAL { 255 }

::= { rwFilterEntry 9 }

rwFilterDstL4PortMin OBJECT-TYPE
        SYNTAX InetPortNumber
        STATUS current
        DESCRIPTION
            "The minimum value that the packet's layer 4 destination
            port number can have and match this filter. This value must
            be equal to or lesser that the value specified for this
            filter in RwFilterDstL4PortMax.

            COPS-PR error code 'attrValueInvalid' must be returned if
            the RwFilterDstL4PortMin is greater than
            RwFilterDstL4PortMax"
        REFERENCE
```

```
                    "COPS Usage for Policy Provisioning. RFC 3084, error
                    codes section 4.5."
              DEFVAL { 0 }

::= { rwFilterEntry 10 }

rwFilterDstL4PortMax OBJECT-TYPE
        SYNTAX InetPortNumber
        STATUS current
        DESCRIPTION
            "The maximum value that the packet's layer 4 destination
            port number can have and match this filter. This value must
            be equal to or greater that the value specified for this
            filter in RwFilterDstL4PortMin.

            COPS-PR error code 'attrValueInvalid' must be returned if
            the RwFilterDstL4PortMax is less than
            RwFilterDstL4PortMin"
        REFERENCE
            "COPS Usage for Policy Provisioning. RFC 3084, error
            codes section 4.5."
            DEFVAL { 65535 }
::= { rwFilterEntry 11 }

rwFilterSrcL4PortMin OBJECT-TYPE
        SYNTAX InetPortNumber
        STATUS current
        DESCRIPTION
            "The minimum value that the packet's layer 4 source port
            number can have and match this filter. This value must
            be equal to or lesser that the value specified for this
            filter in RwFilterSrcL4PortMax.

            COPS-PR error code 'attrValueInvalid' must be returned if
            the RwFilterSrcL4PortMin is greater than
            RwFilterSrcL4PortMax"
        REFERENCE
            "COPS Usage for Policy Provisioning. RFC 3084, error
            codes section 4.5."
            DEFVAL { 0 }
::= { rwFilterEntry 12 }

rwFilterSrcL4PortMax OBJECT-TYPE
        SYNTAX InetPortNumber
        STATUS current
        DESCRIPTION
            "The maximum value that the packet's layer 4 source port
            number can have and match this filter. This value must be
            equal to or greater that the value specified for this filter
            in RwFilterSrcL4PortMin.

            COPS-PR error code 'attrValueInvalid' must be returned if
            the RwFilterSrcL4PortMax is less than
            RwFilterSrcL4PortMin"
            REFERENCE
            "COPS Usage for Policy Provisioning. RFC 3084, error codes
            section 4.5."
        DEFVAL { 65535 }
::= { rwFilterEntry 13 }
----------------------------------------------------------------------
--
-- RW Flux Info Table
--
```

```
rwFluxInfoTable OBJECT-TYPE
      SYNTAX SEQUENCE OF RwFluxInfoEntry
      PIB-ACCESS install
      STATUS current
      DESCRIPTION
         " PRC representing the bandwidth information ."
::= { rwServiceInfoClasses 10 }

rwFluxInfoEntry OBJECT-TYPE
      SYNTAX RwFluxInfoEntry
      STATUS current
      DESCRIPTION
         " An entry in the Flux Info Table describing the bandwidth
         information of a flow in the direction of uplink or downlink.
         It is referenced by RwFlowDirDec, RwVSWITCHFluxInfoBaseFluxInfo and
      RwUserbasedDecInfo. "
      PIB-INDEX { RwFluxInfoPrid }
      UNIQUENESS { }
::= { rwFluxInfoTable 1 }

RwFluxInfoEntry ::= SEQUENCE {
         rwFluxInfoPrid                  InstanceId,
         rwFluxInfoBandwidthUnit            INTEGER,
         rwFluxInfoPeakBandwidth            Unsigned32,
         rwFluxInfoAverageBandwidth    Unsigned32,
         rwFluxInfoMaxPktLength             Unsigned32

      }

rwFluxInfoPrid OBJECT-TYPE
      SYNTAX InstanceId
      STATUS current
      DESCRIPTION
         "An arbitrary integer index that uniquely identifies an
         instance of the Rw Flux class."
::= { rwFluxInfoEntry 1 }

rwFluxInfoBandwidthUnit OBJECT-TYPE --bandwidth unit
      SYNTAX INTEGER {
               bps     (1),
               kbps    (2),
               mbps    (3)
            }
      STATUS current
      DESCRIPTION
         "Indication of the unit of measure for RwFluxPeakBandwidth and
         RwFluxAverageBandwidth, in bits per second, kilo bits per second,
         or mega bits per second."
::= { rwFluxInfoEntry 2 }

rwFluxInfoPeakBandwidth OBJECT-TYPE --peak bandwidth
      SYNTAX Unsigned32
      STATUS current
      DESCRIPTION "The Flux peek bandwidth."
::= { rwFluxInfoEntry 3 }

rwFluxInfoAverageBandwidth OBJECT-TYPE    --average bandwidth
      SYNTAX Unsigned32
      STATUS current
      DESCRIPTION "The Flux average bandwidth."
::= { rwFluxInfoEntry 4 }

rwFluxInfoMaxPktLength OBJECT-TYPE        -- Max package length
      SYNTAX Unsigned32
```

```
            STATUS current
            DESCRIPTION "The Flux max packet length."
::= { rwFluxInfoEntry 5 }



---------------------------------------------------------------------
--
-- RW VSWITCH Flux Table
--

rwVSWITCHFluxInfoTable OBJECT-TYPE
        SYNTAX SEQUENCE OF RwVSWITCHFluxInfoEntry
        PIB-ACCESS  install
        STATUS current
        DESCRIPTION " PRC representing the flux information."
::= { rwServiceInfoClasses 11 }

rwVSWITCHFluxInfoEntry OBJECT-TYPE
        SYNTAX RwVSWITCHFluxInfoEntry
        STATUS current
        DESCRIPTION
          " An  entry  in  the  VSWITCH  Flux  Info  Table  describing  the  flux
information  of  a  flow  in  the  direction  of  uplink  or  downlink.
          It  is  referenced  by  RwFlowDirDec."
        PIB-INDEX { RwVSWITCHFluxInfoPrid }
        UNIQUENESS { }
::= { rwVSWITCHFluxInfoTable 1 }

RwVSWITCHFluxInfoEntry ::= SEQUENCE {
        rwVSWITCHFluxInfoPrid                     InstanceId,
        rwVSWITCHFluxInfoBaseFluxInfo       Prid,
        rwVSWITCHFluxInfoFlowPriority       INTEGER,
        rwVSWITCHFluxInfoCarFlag            INTEGER,
        rwVSWITCHFluxInfoBroadcastBateFlag       INTEGER,
        rwVSWITCHFluxInfoPathBackupFlag     INTEGER,
        }

rwVSWITCHFluxInfoPrid OBJECT-TYPE
        SYNTAX InstanceId
        STATUS current
        DESCRIPTION
          "An arbitrary integer index that uniquely identifies an
          instance of the Rw VSWITCH Flux class."
::= { rwVSWITCHFluxInfoEntry 1 }

rwVSWITCHFluxInfoBaseFluxInfo OBJECT-TYPE -- base traffic information
        SYNTAX Prid
        STATUS current
        DESCRIPTION
          "Reference the instances of the RwFluxInfoTable,
          contain the basic bandwidth information "
::= { rwVSWITCHFluxInfoEntry 2 }

rwVSWITCHFluxInfoFlowPriority OBJECT-TYPE      -- flow Priority
        SYNTAX INTEGER
        STATUS current
        DESCRIPTION
          "Indication of the flow's priority.
          Can be divided to 8. level0 - 7"
::= { rwVSWITCHFluxInfoEntry 3 }


rwVSWITCHFluxInfoCarFlag OBJECT-TYPE             --car flag
        SYNTAX INTEGER
```

```
         STATUS current
         DESCRIPTION
             "Indicate whether the route will do car."
::= { rwVSWITCHFluxInfoEntry 4 }


rwVSWITCHFluxInfoBroadcastBateFlag OBJECT-TYPE  --broadcast bate flag
         SYNTAX INTEGER
         STATUS current
         DESCRIPTION
             "The flag indicates the bate of broadcast, if true,
             make car."
::= { rwVSWITCHFluxInfoEntry 5 }

rwVSWITCHFluxInfoPathBackupFlag OBJECT-TYPE      -- Path backup flag
         SYNTAX INTEGER
         STATUS current
         DESCRIPTION
             "The flag indicates whether there is backup path"
::= { rwVSWITCHFluxInfoEntry 6 }

-----------------------------------------------------------------
-- Path Selection Information in the core network
--
-- MPLS Connection Table
--

rwMPLSConnectInfoTable OBJECT-TYPE
         SYNTAX SEQUENCE OF RwMPLSConnectInfoEntry
         PIB-ACCESS  install
         STATUS current
         DESCRIPTION
             " PRC representing the MPLS LSP information.."
::= { rwServiceInfoClasses 12 }

rwMPLSConnectInfoEntry OBJECT-TYPE
         SYNTAX RwMPLSConnectInfoEntry
         STATUS current
         DESCRIPTION
             " An  entry  in  the  MPLS  Connection  Table  describing  the  MPLS  LSP
information.
             It is referenced by RwFlowDescConnectInfo."
         PIB-INDEX { RwMPLSConnectInfoPrid }
         UNIQUENESS { }
::= { rwMPLSConnectInfoTable 1 }

RwMPLSConnectInfoEntry ::= SEQUENCE {
         rwMPLSConnectInfoPrid                 InstanceId,
         rwMPLSConnectInfoPathMTU        Unsigned32,
         rwMPLSConnectInfoMPLSStack      Prid
         }

rwMPLSConnectInfoPrid OBJECT-TYPE
         SYNTAX InstanceId
         STATUS current
         DESCRIPTION
             "An arbitrary integer index that uniquely identifies an
             instance of the Rw Connection Info class."
::= { rwMPLSConnectInfoEntry 1 }

rwMPLSConnectInfoPathMTU OBJECT-TYPE       --Maximum transport unit in the path
         SYNTAX Unsigned32
         STATUS current
         DESCRIPTION
```

```
                "The MTU in the path."
::= { rwMPLSConnectInfoEntry 2 }

rwMPLSConnectInfoMPLSStack OBJECT-TYPE    --label stack
        SYNTAX Prid
        STATUS current
        DESCRIPTION
            "References the first of a list of Rw MPLS Label.

            A value of zeroDotZero indicates an empty list which is an error
condition."
        DEFVAL { zeroDotZero }
::= { rwMPLSConnectInfoEntry 3 }

----------------------------------------------------------------
--
-- Rw MPLS Label Table
--

rwMPLSLabelTable OBJECT-TYPE
        SYNTAX SEQUENCE OF RwMPLSLabelEntry
        PIB-ACCESS  install
        STATUS current
        DESCRIPTION
            "PRC representing the MPLS label stack.."
::= { rwServiceInfoClasses 13 }

rwMPLSLabelEntry OBJECT-TYPE
        SYNTAX RwMPLSLabelEntry
        STATUS current
        DESCRIPTION
            "An entry in the MPLS Label Table describing the MPLS label stack.
            It is referenced by RwMPLSConnectInfoMPLSStack. "
        PIB-INDEX { RwMPLSLabelPrid }
        UNIQUENESS { }
::= { rwMPLSLabelTable 1 }

RwMPLSLabelEntry ::= SEQUENCE {
            rwMPLSLabelPrid                     InstanceId,
            rwMPLSLabelValue                    Prid,
            rwMPLSLabelNext                     Prid
        }

rwMPLSLabelPrid OBJECT-TYPE
        SYNTAX InstanceId
        STATUS current
        DESCRIPTION
            "An arbitrary integer index that uniquely identifies an
            instance of the Rw label class."
::= { rwMPLSLabelEntry 1 }

rwMPLSLabelValue OBJECT-TYPE
        SYNTAX Prid
        STATUS current
        DESCRIPTION
            "The label value, reference the frwkILabelMarkerTable in RFC3318 "
::= { rwMPLSLabelEntry 2 }

rwMPLSLabelNext OBJECT-TYPE
        SYNTAX Prid
        STATUS current
        DESCRIPTION
            "References the next RwLabelEntry of a list RwLabel
            class."
```

```
        DEFVAL { zeroDotZero }
::= { rwMPLSLabelEntry 3 }

-----------------------------------------------------------------
-- VSwitch Connection Table
--

rwVSWITCHConnectInfoTable OBJECT-TYPE
        SYNTAX SEQUENCE OF RwVSWITCHConnectInfoEntry
        PIB-ACCESS  install
        STATUS current
        DESCRIPTION
           " PRC representing the information of the VSWITCH connection."
::= { rwServiceInfoClasses 14 }

rwVSWITCHConnectInfoEntry OBJECT-TYPE
        SYNTAX RwVSWITCHConnectInfoEntry
        STATUS current
        DESCRIPTION
           " An entry in the MPLS Connection Table describing the information of
the VSWITCH connection.
           It is referenced by RwFlowDescConnectInfo."
        PIB-INDEX { RwVSWITCHConnectInfoPrid }
        UNIQUENESS { }
::= { rwVSWITCHConnectInfoTable 1 }

RwVSWITCHConnectInfoEntry ::= SEQUENCE {
        rwVSWITCHConnectInfoPrid          InstanceId,
        rwVSWITCHConnectInfoSrcIFName    OCTET STRING,
        rwVSWITCHConnectInfoSrcVlanID    Unsigned32,
        rwVSWITCHConnectInfoSrcVlanIDQinQ     Unsigned32,
        rwVSWITCHConnectInfoDstIFName    OCTET STRING,
        rwVSWITCHConnectInfoDstVlanID    Unsigned32,
        rwVSWITCHConnectInfoDstVlanIDQinQ     Unsigned32

        }

rwVSWITCHConnectInfoPrid OBJECT-TYPE
        SYNTAX InstanceId
        STATUS current
        DESCRIPTION
           "An arbitrary integer index that uniquely identifies an
           instance of the Rw VSWITCH Connection Info class."
::= { rwVSWITCHConnectInfoEntry 1 }

rwVSWITCHConnectInfoSrcIFName OBJECT-TYPE
--source interface address information
        SYNTAX OCTET STRING
        STATUS current
        DESCRIPTION
           "Source Interface Name."
::= { rwVSWITCHConnectInfoEntry 2 }

rwVSWITCHConnectInfoSrcVlanID OBJECT-TYPE       --source VlanID
        SYNTAX Unsigned32(0..64535)
        STATUS current
        DESCRIPTION
           "Source VlanID."
::= { rwVSWITCHConnectInfoEntry 3 }

rwVSWITCHConnectInfoSrcVlanIDQinQ OBJECT-TYPE   --source VlanID QinQ
        SYNTAX Unsigned32(0..64535)
        STATUS current
        DESCRIPTION
```

```
             "It's the normal 802.1Q when the value is illegal or invalid.
             If the value is valid ,it's the QinQ, the value is inner
             VlanID and RwVSWITCHConnectInfoSrcVlanID is the outer VlanID"
::= { rwVSWITCHConnectInfoEntry 4 }

rwVSWITCHConnectInfoDstIFName OBJECT-TYPE
        --destination interface address information
        SYNTAX OCTET STRING
        STATUS current
        DESCRIPTION
            "Dest Interface Name."
::= { rwVSWITCHConnectInfoEntry 5 }

rwVSWITCHConnectInfoDstVlanID OBJECT-TYPE        --destination VlanID
        SYNTAX Unsigned32(0..64535)
        STATUS current
        DESCRIPTION
            "Dest VlanID."
::= { rwVSWITCHConnectInfoEntry 6 }

rwVSWITCHConnectInfoDstVlanIDQinQ OBJECT-TYPE    --destination VlanID QinQ
        SYNTAX Unsigned32(0..64535)
        STATUS current
        DESCRIPTION
            "It's the normal 802.1Q when the value is illegal or invalid.
             If the value is valid ,it's the QinQ, the value is inner
             VlanID and RwVSWITCHConnectInfoSrcVlanID is the outer VlanID"
::= { rwVSWITCHConnectInfoEntry 7 }

---------------------------------------------------------------------
--
-- Rw Request Info Classes
--
--
-- Rw Request Info Table
--

rwReqInfoTable OBJECT-TYPE
        SYNTAX SEQUENCE OF RwReqInfoEntry
        PIB-ACCESS notify
        STATUS current
        DESCRIPTION
            "PRC  from  PE-PE  to  PD-PE,  indicating  the  physical  and/or  logical
connection  of  the  access  transport  network  that  the  CPE  is  attached  to,
requesting user-based policy."
::= { rwReqInfoClasses 1 }

rwReqInfoEntry OBJECT-TYPE
        SYNTAX RwReqInfoEntry
        STATUS current
        DESCRIPTION
            " An instance of the RwReqInfo class sent by PE-PE to PD-PE. "
        PIB-INDEX { RwReqInfoPrid }
        UNIQUENESS { }
::= { rwReqInfoTable 1 }

RwReqInfoEntry ::= SEQUENCE {
        rwReqInfoPrid             InstanceId,
        rwReqInfoIPAddrType       InetAddressType,
        rwReqInfoIPAddress        InetAddress,
        rwReqInfoUserId               OCTET STRING,
        rwReqInfoMacAddr              OCTET STRING,
        rwReqInfoPhyInfo              OCTET STRING,
        rwReqBindingTokenRefPrid  Prid
```

```
         }

rwReqInfoPrid OBJECT-TYPE
      SYNTAX InstanceId
      STATUS current
      DESCRIPTION
         "An arbitrary integer index that uniquely identifies an
         instance of the RwReqInfo entry."
::= { rwReqInfoEntry 1 }

rwReqInfoIPAddrType OBJECT-TYPE
      SYNTAX InetAddressType
      STATUS current
      DESCRIPTION
         "The address type enumeration value to specify the type of the CPE's
IP address(Ipv4, Ipv6 or DNS etc.)."
::= { rwReqInfoEntry 2 }

rwReqInfoIPAddress OBJECT-TYPE
      SYNTAX InetAddress
      STATUS current
      DESCRIPTION
         "CPE's Ip Address."
::= { rwReqInfoEntry 3 }

rwReqInfoUserId OBJECT-TYPE
      SYNTAX OCTET STRING(SIZE (0..67))
      STATUS current
      DESCRIPTION
         "User ID uniquely identifies the CPE, in a format consistent with the
NAI specification."
::= { rwReqInfoEntry 4 }

rwReqInfoMacAddr OBJECT-TYPE
      SYNTAX OCTET STRING(SIZE (0..16))
      STATUS current
      DESCRIPTION
         "CPE's Mac Address. "
::= { rwReqInfoEntry 5 }

rwReqInfoPhyInfo OBJECT-TYPE
      SYNTAX OCTET STRING(SIZE (0..63))
      STATUS current
      DESCRIPTION
         "CPE's physics information."
::= { rwReqInfoEntry 6 }

rwReqBindingTokenRefPrid OBJECT-TYPE
      SYNTAX Prid
      STATUS current
      DESCRIPTION
         "This shall be used for pull mode supporting Authorization token for
binding purposes. This shall refer to instance of RwReqBindingToken class. Value
zeroDotZero shall refer to absence of authorization token and this value could
be used when different mechanism other than authorization token is used for
binding purposes in pull mode"
      DEFVAL { zeroDotZero }
::= { rwReqInfoEntry 7 }

-------------------------------------------------------------------------
--
-- Rw Binding Token Table
--
```

```
rwReqBindingTokenTable OBJECT-TYPE
        SYNTAX SEQUENCE OF RwReqBindingTokenEntry
        PIB-ACCESS notify
        STATUS current
        DESCRIPTION
 "PRC from PE-PE to PD-PE, containing the authorization token which is used for
pull scenario using this authorization token as binding mechanism."
::= { rwReqInfoClasses 2 }

rwReqBindingTokenEntry OBJECT-TYPE
        SYNTAX RwReqBindingTokenEntry
        STATUS current
        DESCRIPTION
            " An instance of the RwReqBinding class sent by PE-PE to PD-PE. "
        PIB-INDEX { RwReqBindingTokenPrid }
        UNIQUENESS { }
::= { rwReqBindingTokenTable 1 }

RwReqBindingTokenEntry::= SEQUENCE {
        rwReqBindingTokenPrid                InstanceId,
        rwReqBindingTokenValue               OCTET STRING
        }
rwReqBindingTokenPrid OBJECT-TYPE
        SYNTAX InstanceId
        STATUS current
        DESCRIPTION
            "An arbitrary integer index that uniquely identifies an
            instance of the RwReqBindingToken entry."
::= { rwReqBindingTokenEntry 1 }

rwReqBindingTokenValue OBJECT-TYPE
        SYNTAX OCTET STRING
        STATUS current
        DESCRIPTION
"Contains authorization token for pull mode binding purposes."
::= { rwReqBindingTokenEntry 2 }

-------------------------------------------------------------
-- Rw Decision Info classes

-- Rw Flow-based Decision Information Table
--

rwFlowBasedDecInfoTable OBJECT-TYPE
        SYNTAX SEQUENCE OF RwFlowBasedDecInfoEntry
        PIB-ACCESS install
        STATUS current
        DESCRIPTION
            " PRC  from  PD-PE  to  PE-PE  carried  by  COPS-PR  Install  decision,
providing flow-based policy and/or NAT request."
::= { rwDecInfoClasses 1 }

rwFlowBasedDecInfoEntry OBJECT-TYPE
        SYNTAX RwFlowBasedDecInfoEntry
        STATUS current
        DESCRIPTION
            " An instance of the RwFlowBasedDecInfo class sent by PD-PE to
            PE-PE, carrying the QoS policy and/or NAT request."
        PIB-INDEX { RwFlowBasedDecInfoPrid }
        UNIQUENESS { }
::= { rwFlowBasedDecInfoTable 1 }

RwFlowBasedDecInfoEntry ::= SEQUENCE {
        rwFlowBasedDecInfoPrid                    InstanceId,
```

```
                rwFlowBasedDecInfoRequestPriority          Integer32,
                rwFlowBasedDecInfoFlowDesc          Prid,
                rwFlowBasedDecInfoNatAction         Prid,
                rwFlowBasedDecInfoEventIndicator    Prid,
                rwFlowBasedDecAppChrgIds            Prid
        }

rwFlowBasedDecInfoPrid OBJECT-TYPE
        SYNTAX InstanceId
        STATUS current
        DESCRIPTION
            "An arbitrary integer index that uniquely identifies an
            instance of the RwFlowBasedDecInfo Entry."
::= { rwFlowBasedDecInfoEntry 1 }

rwFlowBasedDecInfoRequestPriority OBJECT-TYPE
        SYNTAX Integer32(0-7)
        STATUS current
        DESCRIPTION
            " The indication of the importance of a resource control request. It
can be used for processing simultaneous requests by PE-PE based on the priority
level. 0 is the lowest level of priority by default."
        DEFVAL { 0 }
::= { rwFlowBasedDecInfoEntry 2 }

rwFlowBasedDecInfoFlowDesc OBJECT-TYPE
        SYNTAX Prid
        STATUS current
        DESCRIPTION
            "References the first of a list of RwFlowDesc associated
            with this instance of RwFlowBasedDecInfo.
            A value of zeroDotZero indicates an empty list which is an error
condition."
::= { rwFlowBasedDecInfoEntry 3 }

rwFlowBasedDecInfoNatAction OBJECT-TYPE
        SYNTAX Prid
        STATUS current
        DESCRIPTION
            " An arbitrary integer index that references the first of a list of
RwNatAction Instances.
            References the first of a list of RwNatAction class instances that are
associated with this decision.
            A value of zeroDotZero indicates there are no RwNatAction class
instance associated with this decision."
::= { rwFlowBasedDecInfoEntry 4 }

rwFlowBasedDecInfoEventIndicator OBJECT-TYPE
        SYNTAX Prid
        STATUS current
        DESCRIPTION
            " an arbitrary integer that uniquely identifies an instance of the
RwEventIndicator Entry."
::= { rwFlowBasedDecInfoEntry 5 }

rwFlowBasedDecAppChrgIds OBJECT-TYPE
        SYNTAX Prid
        STATUS current
        DESCRIPTION
            " An arbitrary integer index that uniquely identifies an instance of
the RwAppChrgInfo.
```

```
         There should be one Application Charging ID for each session
identified by a Client Handle value. A value of zeroDotZero indicates an empty
list and there is no Application Charging Info associated with this Decision."
        DEFVAL { zeroDotZero }
::= { rwFlowBasedDecInfoEntry 6 }

-----------------------------------------------------------------------
--
--Rw NAT action Table
--

rwNatActionTable OBJECT-TYPE
        SYNTAX SEQUENCE OF RwNatActionEntry
        PIB-ACCESS  install
        STATUS current
        DESCRIPTION
          " PRC representing NAT Action information. Sent by PD-PE to indicate
which type of NAT is requested in PE-PE. In a COPS-PR install decision object."
::= { rwDecInfoClasses 2 }

rwNatActionEntry OBJECT-TYPE
        SYNTAX RwNatActionEntry
        STATUS current
        DESCRIPTION
          " An entry in the NAT Action Table describing a single NAT type.
          Each entry is referenced by RwDecInfoNatAction or RwNatActionNext."
        PIB-INDEX { RwNatActionPrid }
        UNIQUENESS { }
::= { rwNatActionTable 1 }

RwNatActionEntry ::= SEQUENCE {
        rwNatActionPrid                 InstanceId,
        rwNatAction                     Integer32,
        rwNatActionNext                 Prid,
        }

rwNatActionPrid OBJECT-TYPE
        SYNTAX InstanceId
        STATUS current
        DESCRIPTION
          "An arbitrary integer index that uniquely identifies an
          instance of the RwNatAction class."
::= { rwNatActionEntry 1 }

rwNatAction OBJECT-TYPE
        SYNTAX Integer32{
                addressTranslation(1),
                portTranslation(2),
                protocolTranslation(3)
                }
        STATUS current
        DESCRIPTION
          " The basic type of Nat which the PD-PE request the PE-PE to perform."
::= { rwNatActionEntry 2 }

rwNatActionNext OBJECT-TYPE
        SYNTAX Prid
        STATUS current
        DESCRIPTION
          " References the next RwNatActionEntry of a list NatAction. There
should be one NAT action on this list for each service install in the COPS-PR
install decision. A value of zeroDotZero indicates the end of the list of NAT
action."
::= { rwNatActionEntry 3 }
```

```
-------------------------------------------------------------------------
-------
--
-- Rw Application Charging Information Table
--

rwAppChrgInfoTable OBJECT-TYPE
        SYNTAX SEQUENCE OF RwAppChrgInfoEntry
        PIB-ACCESS  install
        STATUS current
        DESCRIPTION
            "Represents Application Charging Info"
::= { rwDecInfoClasses 3 }


rwAppChrgInfoEntry OBJECT-TYPE
        SYNTAX RwAppChrgInfoEntry
        STATUS current
        DESCRIPTION
            " An  entry  in  the  App  Chrg  Info  Table  describing  the  Application
charging Info.
            It is referenced by RwFlowBasedDecAppChrgIds. "
        PIB-INDEX { RwAppChrgInfoPrInfo }
        UNIQUENESS { }
::= { rwAppChrgInfoTable 1 }

RwAppChrgInfoEntry ::= SEQUENCE {
        rwAppChrgInfoPrInfo       InstanceId,
        rwAppChrgInfoValue        OCTET STRING
        }

rwAppChrgInfoPrInfo OBJECT-TYPE
        SYNTAX InstanceId
        STATUS current
        DESCRIPTION
            "An arbitrary integer index that uniquely identifies an
            instance of the RwAppChrgInfo class."
::= { rwAppChrgInfoEntry 1 }

rwAppChrgInfoValue OBJECT-TYPE
        SYNTAX OCTET STRING
        STATUS current
        DESCRIPTION
            "The Application charging Id. "
::= { rwAppChrgInfoEntry 2 }

-----------------------------------------------------------------------
--
-- Rw User-based Decision Information Table
--

rwUserBasedDecInfoTable OBJECT-TYPE
        SYNTAX SEQUENCE OF RwUserBasedDecInfoEntry
        PIB-ACCESS  install
        STATUS current
        DESCRIPTION
            " PRC  from  PD-PE  to  PE-PE  carried  by  COPS-PR  install  decision,
provision user-based policy."
::= { rwDecInfoClasses 4 }

rwUserBasedDecInfoEntry OBJECT-TYPE
        SYNTAX RwUserBasedDecInfoEntry
        STATUS current
```

```
        DESCRIPTION
            " An entry in the User based Dec Info Table describing the policy
information."
        PIB-INDEX { RwUserBasedDecInfoPrid }
        UNIQUENESS { }
::= { rwUserBasedDecInfoTable 1 }

RwUserBasedDecInfoEntry ::= SEQUENCE {
        rwUserBasedDecInfoPrid                    InstanceId,
        rwUserBasedDecInfoUserId          Unsigned32,
        rwUserBasedDecInfoPolicyId        Unsigned32,
        rwUserBasedDecInfoNetworkClass    Prid,
        rwUserBasedDecInfoDirFlux         Prid
        }

rwUserBasedDecInfoPrid OBJECT-TYPE
        SYNTAX InstanceId
        STATUS current
        DESCRIPTION
            "An arbitrary integer index that uniquely identifies an
            instance of the RwUserBasedDecInfo class."
::= { rwUserBasedDecInfoEntry 1 }

rwUserBasedDecInfoUserId OBJECT-TYPE
        SYNTAX Unsigned32
        STATUS current
        DESCRIPTION
            "User ID uniquely identifies the user for which
            the policy is applied."
::= { rwUserBasedDecInfoEntry 2 }

rwUserBasedDecInfoPolicyId OBJECT-TYPE
        SYNTAX Unsigned32
        STATUS current
        DESCRIPTION
            "PolicyID is the handle of one policy. The PolicyID is
            assigned by PDP. Since there can be a many to many relationship
            between PDP and PEP, the PolicyID allocated by different PDP can
            not be guaranteed to be unique across network. So PEP can use IP
            address of the PDP along with PolicyID to uniquely identify a
            dedicated policy."
::= { rwUserBasedDecInfoEntry 3 }

rwUserBasedDecInfoNetworkClass OBJECT-TYPE
        SYNTAX Prid
        STATUS current
        DESCRIPTION
            " An arbitrary integer index that uniquely identifies an instance of
the NetworkClass. A value of zeroDotZero indicates the default network service
class ."
        DEFVAL { zeroDotZero }
::= { rwUserBasedDecInfoEntry 4 }

rwUserBasedDecInfoDirFlux OBJECT-TYPE
        SYNTAX Prid
        STATUS current
        DESCRIPTION
            " An arbitrary integer index that uniquely identifies an instance of
the RwDirFlux. A value of zeroDotZero indicates the default bandwidth ."
        DEFVAL { zeroDotZero }
::= { rwUserBasedDecInfoEntry 5 }

--------------------------------------------------------------------------
--
```

```
--Rw Network Class Table
--
rwNetworkClassTable OBJECT-TYPE
        SYNTAX SEQUENCE OF RwNetworkClassEntry
        PIB-ACCESS  install
        STATUS current
        DESCRIPTION
           " PRC representing network service class subscribed by a CPE sent by
PD-PE to PE-PE. In a COPS-PR install decision object."
::= { rwDecInfoClasses 5 }

rwNetworkClassEntry OBJECT-TYPE
        SYNTAX RwNetworkClassEntry
        STATUS current
        DESCRIPTION
           " An entry in the Network Class Table describing network service class
subscribed by a CPE.
           Referenced by RwUserBasedDecInfoNetworkClass."
        PIB-INDEX { RwNetworkClassPrid }
        UNIQUENESS { }
::= { rwNetworkClassTable 1 }

RwNetworkClassEntry ::= SEQUENCE {
           rwNetworkClassPrid  InstanceId,
           rwNetworkClass      OCTET STRING
        }

rwNetworkClassPrid OBJECT-TYPE
        SYNTAX InstanceId
        STATUS current
        DESCRIPTION
           "An arbitrary integer index that uniquely identifies an
           instance of the RwNetworkClass."
::= { rwNetworkClassEntry 1 }

rwNetworkClass OBJECT-TYPE
        SYNTAX OCTET STRING
        STATUS current
        DESCRIPTION
           " the network service class subscribed by a CPE (e.g., Premium, Gold,
Silver, and Regular)."
::= { rwNetworkClassEntry 2 }

--------------------------------------------------------------------------------
--
-- Rw Dir Flux Table
--

rwDirFluxTable OBJECT-TYPE
        SYNTAX SEQUENCE OF RwDirFluxEntry
        PIB-ACCESS  install
        STATUS current
        DESCRIPTION
           " PRC representing uplink and/or downlink bandwidth information, sent
by PD-PE to PE-PE. In a COPS-PR install decision object."
::= { rwDecInfoClasses 6 }

rwDirFluxEntry OBJECT-TYPE
        SYNTAX RwDirFluxEntry
        STATUS current
        DESCRIPTION
           " An entry in the Direction Flux Table describing uplink and/or
downlink bandwidth information subscribed by a CPE.
           Referenced by RwUserBasedDecInfoDirFlux."
```

```
        PIB-INDEX { RwDirFluxPrid }
        UNIQUENESS { }
::= { rwDirFluxTable 1 }

RwDirFluxEntry ::= SEQUENCE {
        rwDirFluxPrid           InstanceId,
        rwDirFluxDirection      Integer32,
        rwDirFluxInfo           Prid,
        rwDirFluxNext           Prid
        }

rwDirFluxPrid OBJECT-TYPE
        SYNTAX InstanceId
        STATUS current
        DESCRIPTION
           "An  arbitrary  integer  index  that  uniquely  identifies  an  instance  of
the RwDirFlux."
::= { rwDirFluxEntry 1 }

rwDirFluxDirection OBJECT-TYPE
        SYNTAX Integer32 {
                   uplink(1),
                   downlink(2)
               }
        STATUS current
        DESCRIPTION
           "Indicates the direction the flow."
::= { rwDirFluxEntry 2 }

rwDirFluxInfo OBJECT-TYPE
        SYNTAX Prid
        STATUS current
        DESCRIPTION
           " An arbitrary integer index that references the RwFluxInfo Instances
."
::= { rwDirFluxEntry 3 }

rwDirFluxNext OBJECT-TYPE
        SYNTAX Prid
        STATUS current
        DESCRIPTION
           " References  the  next  RwDirFluxEntry.  There  should  be  at  most  two
Directional Flux per COPS-PR install decision. A value of zeroDotZero indicates
the end of the list of DirFlux."
::= { rwDirFluxEntry 4 }

-----------------------------------------------------------------------
-- Rw Report Classes

-- Rw State Report Table
--

rwStateReportTable OBJECT-TYPE
        SYNTAX SEQUENCE OF RwStateReportEntry
        PIB-ACCESS notify
        STATUS current
        DESCRIPTION
 " PRCs from PE-PE to PD-PE carried by the COPS-PR RPT message, carrying the
Decision enforcement result or the notification of transport event."
::= { rwReportClasses 1 }

rwStateReportEntry OBJECT-TYPE
        SYNTAX RwStateReportEntry
        STATUS current
```

```
        DESCRIPTION
            " An entry in the State Report Table describing the Decision
enforcement result or the notification of transport event."
        PIB-INDEX { RwStateReportPrid }
        UNIQUENESS { }
::= { rwStateReportTable 1 }

RwStateReportEntry ::= SEQUENCE {
        rwStateReportPrid               InstanceId,
        rwStateReportStatus             INTEGER,
        rwStateReportDetails            Prid,
        rwStateReportNATInfoFlowDesc    Prid
        }

rwStateReportPrid OBJECT-TYPE
        SYNTAX InstanceId
        STATUS current
        DESCRIPTION
            "An arbitrary integer index that uniquely identifies an
            instance of the RwDecResultRpt class."
::= { rwStateReportEntry 1 }

rwStateReportStatus OBJECT-TYPE
            SYNTAX INTEGER {
                    success (1),
                    failure (2),
                    event (3) }
        STATUS current
        DESCRIPTION
            "When Status is:
            success: Indicates the successful implementation of the
                decision.
                RwStateReportDetails:
                    Reference an instance of RwRprtBearChrgInfo for the a
successful session; or the
                    References nothing otherwise (contains the value zeroDotZero).
            Failure: Indicates the failure of implementing the decision.
                RwStateReportDetails may references an Error object,
                or may have the value zeroDotZero when no error
                object is needed, in which case COPS and COPS-PR
                error codes and error objects are sufficient.
            Event: RwStateReportDetails references an instance of
                RwEventIndicator."
::= { rwStateReportEntry 2 }

rwStateReportDetails OBJECT-TYPE
        SYNTAX Prid
        STATUS current
        DESCRIPTION
        "May reference an instance of RwRprtBearChrgInfo, RwEventIndicator, or
may have the value of zeroDotZero depending on the value of
RwStateReportStatus."
::= { rwStateReportEntry 3 }

rwStateReportNATInfoFlowDesc OBJECT-TYPE
        SYNTAX Prid
        STATUS current
        DESCRIPTION
        "Refers to an instance of RwFlowDesc class. This attribute shall refer to
this PRC only if NAT information is requested by PD-PE otherwise this attribute
shall hold value zeroDotzero."
        DEFVAL { zeroDotZero }
::= { rwStateReportEntry 4 }
-----------------------------------------------------------------
```

```
--
--Rw report Bearer charging information Table
--

rwRprtBearChrgInfoTable OBJECT-TYPE
       SYNTAX SEQUENCE OF RwRprtBearChrgInfoEntry
       PIB-ACCESS notify
       STATUS current
       DESCRIPTION
          "PRC representing the bearer charging information"
::= { rwReportClasses 2 }

rwRprtBearChrgInfoEntry OBJECT-TYPE
       SYNTAX RwRprtBearChrgInfoEntry
       STATUS current
       DESCRIPTION
          " An  entry  in  the  Rprt  Bearer  Chrg  Info  Table  describing  the
information of the bearer Charging Identifier and PE-PE address.
          It is referenced by RwStateReportDetails "
       PIB-INDEX { RwRprtBearChrgInfoPrid }
       UNIQUENESS { }
::= { rwRprtBearChrgInfoTable 1 }

RwRprtBearChrgInfoEntry ::= SEQUENCE {
          rwRprtBearChrgInfoPrid         InstanceId,
          rwRprtBearChrgInfoAddrTypeInetAddressType,
          rwRprtBearChrgInfoAddr         InetAddress,
          rwRprtBearChrgInfoChrgId  OCTET STRING
       }

rwRprtBearChrgInfoPrid OBJECT-TYPE
       SYNTAX InstanceId
       STATUS current
       DESCRIPTION
          "An  arbitrary  integer  index  that  uniquely  identifies  an  instance  of
the RwRprtBearChrgInfo class."
::= { rwRprtBearChrgInfoEntry 1 }

rwRprtBearChrgInfoAddrType OBJECT-TYPE
       SYNTAX InetAddressType
       STATUS current
       DESCRIPTION
          "The  address  type  enumeration  value  to  specify  the  type  of  the
charging device's IP address."
::= { rwRprtBearChrgInfoEntry 2 }

rwRprtBearChrgInfoGGSNAddr OBJECT-TYPE
       SYNTAX InetAddress
       STATUS current
       DESCRIPTION
          "Contains  the  IP  Address  of  the  device  providing  the  bearer  charging
Id."
::= { rwRprtBearChrgInfoEntry 3 }

rwRprtBearChrgInfoChrgId OBJECT-TYPE
       SYNTAX OCTET STRING
       STATUS current
       DESCRIPTION
          "The bearer Charging ID related to the session."
::= { rwRprtBearChrgInfoEntry 4 }

------------------------------------------------------------------
--
-- Conformance Section
```

```
--

rwCompliances    OBJECT IDENTIFIER ::= { rwConformance 1 }
rwGroups         OBJECT IDENTIFIER ::= { rwConformance 2 }

rwCompliance MODULE-COMPLIANCE
        STATUS current
        DESCRIPTION
            "Describes the requirements for conformance to the ITUT-RwPIB."
        MODULE FRAMEWORK-PIB          -- Defined in RFC 3318
            MANDATORY-GROUPS {
            frwkPrcSupportGroup,
            frwkILabelMarkerGroup
            }
        MODULE RW-PIB -- this module
            MANDATORY-GROUPS {
            rwDecCapGroup,
            rwDecCapACKGroup,
            rwEventIndicatorGroup,
            rwFlowDescGroup,
            rwSingleFlowInfoGroup,
            rwFlowTerminationGroup,
            rwFlowAddressRealmGroup,
            rwFlowLatchingIndicationGroup,
            rwFlowFirewallModeIndicationGroup,
            rwFlowDirDescGroup,
            rwFlowInfoGroup,
            rwFilterGroup,
            rwFluxInfoGroup,
            rwVSWITCHFluxInfoGroup,
            rwMPLSConnectInfoGroup,
            rwMPLSLabelGroup,
            rwVSWITCHConnectInfoGroup,
            rwReqInfoGroup,
            rwReqBindingTokenGroup,
            rwFlowbasedDecInfoGroup,
            rwNatActionGroup,
            rwAppChrgInfoGroup,
            rwUserBasedDecInfoGroup,
            rwNetworClassGroup,
            rwDirFluxGroup,
            rwStateReportGroup,
            rwRprtBearChrgInfoGroup}
::= { rwCompliances 1 }

rwDecCapGroup OBJECT-GROUP
        OBJECTS {
            RwDecCapAppChrgIds,
            RwDecCapFlowIds
        }
        STATUS current
        DESCRIPTION
            "This  Group  defines  the  PIB  Objects  that  describe  the  Decision
capabilities."
::= { rwGroups 1 }

rwDecCapACKGroup OBJECT-GROUP
        OBJECTS {
            RwDecCapACKEnable,
            RwDecCapACKChrgIds,
        RwDecCapACKFlowIds
        }
        STATUS current
        DESCRIPTION
```

```
              "This Group defines the PIB Objects that describe capabilities which
PE-PE is acceptable."
::= { rwGroups 2 }


rwEventIndicatorGroup OBJECT-GROUP
      OBJECTS {
          rwEventIndicator,
          rwEventIndicatornext
      }
      STATUS current
      DESCRIPTION
          "This  Group  defines  the  PIB  Objects  that  describe  the  query  and
notification of a transport event."
::= { rwGroups 3 }


rwFlowDescGroup OBJECT-GROUP
      OBJECTS {
          rwFlowDescSingleFlowInfo,
          rwFlowDescConnectInfo,
          rwFlowDescNext
      }
      STATUS current
      DESCRIPTION
          "This Group defines the PIB Objects that describe the information of a
list flows in a session."
::= { rwGroups 4 }


rwSingleFlowInfoGroup OBJECT-GROUP
      OBJECTS {
          rwSingleFlowInfoFlowId,
          rwSingleFlowInfoFlowTermination,
          rwSingleFlowInfoAddressRealm,
          rwSingleFlowInfoLatchingIndication,
          rwSingleFlowInfoFirewallmodeIndication,
          rwSingleFlowInfoFlowDirDesc
      }
      STATUS current
      DESCRIPTION
          "This Group defines the PIB Objects that describe the information of a
flow, including QoS information, NAT information and path selection information,
etc."
::= { rwGroups 5 }


rwFlowTerminationGroup OBJECT-GROUP
      OBJECTS {
          rwFlowTermination
      }
      STATUS current
      DESCRIPTION
          "This Group defines the PIB Objects that describe the side information
of a flow(access or core)."
::= { rwGroups 6 }


rwFlowAddressRealmGroup OBJECT-GROUP
      OBJECTS {
          rwFlowAddressRealmAddressRealm
      }
      STATUS current
      DESCRIPTION
          "This  Group  defines  the  PIB  Objects  that  describe  the  realm
information of a flow's source and destination address."
::= { rwGroups 7 }


rwFlowLatchingIndicationGroup OBJECT-GROUP
```

```
        OBJECTS {
            rwFlowLatchingIndicationLatchingIndication
        }
        STATUS current
        DESCRIPTION
            "This  Group  defines  the  PIB  Objects  that  describe  the  latching
information of a flow(latching or relatch)."
::= { rwGroups 8 }

rwFlowFirewallModeIndicationGroup OBJECT-GROUP
        OBJECTS {
            rwFlowFirewallModeIndication
        }
        STATUS current
        DESCRIPTION
            "This Group defines the PIB Objects that describe the information for
dynamic firewall working mode selection."
::= { rwGroups 9 }

rwFlowDirDescGroup OBJECT-GROUP
        OBJECTS {
            rwFlowDirDescInfo,
            rwFlowDirDescFluxInfo,
            rwFlowDirDescNext
        }
        STATUS current
        DESCRIPTION
            "This  Group  defines  the  PIB  Objects  that  describe  the  Qos  and  NAT
information of flow."
::= { rwGroups 10 }

rwFlowInfoGroup OBJECT-GROUP
        OBJECTS {
            rwFlowInfoDirection,
            rwFlowInfoFilter,
            rwFlowInfoFilterStatus,
            rwFlowInfoServiceType
        }
        STATUS current
        DESCRIPTION
            "This  Group  defines  the  PIB  Objects  that  describe  the  filter
information of a flow."
::= { rwGroups 11 }

rwFilterGroup OBJECT-GROUP
        OBJECTS {
            rwFilterDstAddrType,
            rwFilterDstAddr,
            rwFilterDstPrefixLength,
            rwFilterSrcAddrType,
            rwFilterSrcAddr,
            rwFilterSrcPrefixLength,
            rwFilterDscp,
            rwFilterProtocol,
            rwFilterDstL4PortMin,
            rwFilterDstL4PortMax,
            rwFilterSrcL4PortMin,
            rwFilterSrcL4PortMax
        }
        STATUS current
        DESCRIPTION
            "This Group defines the PIB Objects that describe the information of a
filter."
::= { rwGroups 12 }
```

```
rwFluxInfoGroup OBJECT-GROUP
      OBJECTS {
          rwFluxInfoBandwidthUnit,
          rwFluxInfoPeakBandwidth,
          rwFluxInfoAverageBandwidth,
          rwFluxInfoMaxPktLength
      }
      STATUS current
      DESCRIPTION
          "This  Group  defines  the  PIB  Objects  that  describe  the  bandwidth
information."
::= { rwGroups 13 }

rwVSWITCHFluxInfoGroup OBJECT-GROUP
      OBJECTS {
          rwVSWITCHFluxInfoBaseFluxInfo,
          rwVSWITCHFluxInfoFlowPriority,
          rwVSWITCHFluxInfoCarFlag,
          rwVSWITCHFluxInfoBroadcastBateFlag,
          rwVSWITCHFluxInfoPathBackupFlag
      }
      STATUS current
      DESCRIPTION
          "This Group defines the PIB Objects that describe the flux information
of a flow."
::= { rwGroups 14 }

rwMPLSConnectInfoGroup OBJECT-GROUP
      OBJECTS {
          rwMPLSConnectInfoPathMTU,
          rwMPLSConnectInfoMPLSStack
      }
      STATUS current
      DESCRIPTION
          "This  Group  defines  the  PIB  Objects  that  describe  the  MPLS  LSP
information."
::= { rwGroups 15 }

rwMPLSLabelGroup OBJECT-GROUP
      OBJECTS {
          rwMPLSLabelValue,
          rwMPLSLabelNext

      }
      STATUS current
      DESCRIPTION
          "This  Group  defines  the  PIB  Objects  that  describe  the  MPLS  label
stack."
::= { rwGroups 16 }

rwVSWITCHConnectInfoGroup OBJECT-GROUP
      OBJECTS {
          rwVSWITCHConnectInfoSrcIFName,
          rwVSWITCHConnectInfoSrcVlanID,
          rwVSWITCHConnectInfoSrcVlanIDQinQ,
          rwVSWITCHConnectInfoDstIFName,
          rwVSWITCHConnectInfoDstVlanID,
          rwVSWITCHConnectInfoDstVlanIDQinQ
      }
      STATUS current
      DESCRIPTION
          "This Group defines the PIB Objects that describe the information of
the VSWITCH connection."
```

```
::= { rwGroups 17 }

rwReqInfoGroup OBJECT-GROUP
      OBJECTS {
          rwReqInfoIPAddrType,
          rwReqInfoIPAddress,
          rwReqInfoUserId,
          rwReqInfoMacAddr,
          rwReqInfoPhyInfo
      }
      STATUS current
      DESCRIPTION
          "This Group defines the PIB Objects that describe the physical and/or
logical connection of the access transport network that the CPE is attached to."
::= { rwGroups 18 }

rwReqBindingTokenGroup OBJECT-GROUP
      OBJECTS {
          rwReqBindingTokenValue
      }
      STATUS current
      DESCRIPTION
          "This Group defines the PIB Objects that describe the authorization
token which is used for pull scenario using this authorization token as binding
mechanism."
::= { rwGroups 19}

rwFlowbasedDecInfoGroup OBJECT-GROUP
      OBJECTS {
          rwFlowBasedDecInfoRequestPriority,
          rwFlowBasedDecInfoFlowDesc,
          rwFlowBasedDecInfoNatAction,
          rwFlowBasedDecInfoEventIndicator,
          rwFlowBasedDecAppChrgIds
      }
      STATUS current
      DESCRIPTION
          "This Group defines the PIB Objects that describe the information QoS
policy and/or NAT request."
::= { rwGroups 20 }

rwNatActionGroup OBJECT-GROUP
      OBJECTS {
          rwNatAction,
          rwNatActionNext
      }
      STATUS current
      DESCRIPTION
          "This Group defines the PIB Objects that describe the NAT type."
::= { rwGroups 21}

rwAppChrgInfoGroup OBJECT-GROUP
      OBJECTS {
          rwAppChrgInfoValue
      }
      STATUS current
      DESCRIPTION
          "This Group defines the PIB Objects that describe the Application
charging Info."
::= { rwGroups 22 }

rwUserBasedDecInfoGroup OBJECT-GROUP
      OBJECTS {
          rwUserBasedDecInfoUserId,
```

```
            rwUserBasedDecInfoPolicyId,
            rwUserBasedDecInfoNetworkClass,
            rwUserBasedDecInfoDirFlux
        }
        STATUS current
        DESCRIPTION
            "This  Group  defines  the  PIB  Objects  that  describe  the  user-based
policy."
::= { rwGroups 23 }

rwNetworClassGroup OBJECT-GROUP
        OBJECTS {
            rwNetworkClass
        }
        STATUS current
        DESCRIPTION
            "This  Group  defines  the  PIB  Objects  that  describe  network  service
class subscribed by a CPE "
::= { rwGroups 24 }

rwDirFluxGroup OBJECT-GROUP
        OBJECTS {
            rwDirFluxDirection,
            rwDirFluxInfo,
            rwDirFluxNext
        }
        STATUS current
        DESCRIPTION
            "This  Group  defines  the  PIB  Objects  that  describe  uplink  and/or
downlink bandwidth information subscribed by a CPE."
::= { rwGroups 25 }

rwStateReportGroup OBJECT-GROUP
        OBJECTS {
            rwStateReportStatus,
            rwStateReportDetails
        }
        STATUS current
        DESCRIPTION
            "This  Group  defines  the  PIB  Objects  that  describe  the  Decision
enforcement result or the notification of transport event."
::= { rwGroups 26 }

rwRprtBearChrgInfoGroup OBJECT-GROUP
        OBJECTS {
            rwRprtBearChrgInfoAddrType,
            rwRprtBearChrgInfoAddr,
            rwRprtBearChrgInfoChrgId
        }
        STATUS current
        DESCRIPTION
            "This  Group  defines  the  PIB  Objects  that  describe  the  information  of
the bearer Charging Identifier and PE-PE address."
::= { rwGroups 27 }

END
```

Appendix I

Rw stage 2 message to COPS message mapping

(This appendix does not form an integral part of this Recommendation.)

Rw stage 2 message to COPS message mapping is shown in Table I.1.

Table I.1 – Rw stage 2 message to COPS message mapping

Rw Stage 2 Message	Source	Destination	COPS Message Name	Abbreviation
Resource Initiation Request	PD-PE	PE-PE	Decision	DEC
Resource Initiation Response	PE-PE	PD-PE	Report state	RPT
Resource Modification Request	PD-PE	PE-PE	Decision	DEC
Resource Modification Response	PE-PE	PD-PE	Report state	RPT
Resource Action Request	PE-PE	PD-PE	Request	REQ
Resource Action Response	PD-PE	PE-PE	Decision	DEC
Resource Notification	PE-PE	PD-PE	Report state	RPT
Resource Decision Request	PE-PE	PD-PE	Request	REQ
Resource Decision Response	PD-PE	PE-PE	Decision	DEC
Resource Release Request	PD-PE	PE-PE	Decision	DEC
Resource Release Response	PE-PE	PD-PE	Report state	RPT
Abort Resource Request	PE-PE	PD-PE	Delete request state	DRQ
Abort Resource Response	PD-PE	PE-PE	–	– (No response to DRQ in COPS)

Appendix II

Rw stage 2 message parameters to COPS
Object-PIB-PRC-Attribute mapping

(This appendix does not form an integral part of this Recommendation.)

Rw stage 2 message parameters to COPS Object-PIB-PRC-Attribute mapping is shown in Table II.1.

**Table II.1 – Rw stage 2 message parameters to COPS
Object-PIB-PRC-Attribute mapping**

Rw Stage 2 Message Parameter	Object/PIB-PRC-Attribute
PD-FE Identifier	
Resource Control Session Identifier	Client Handle(Object)
Resource Requestor Identifier	
Resource Request Priority	RwDecInfoClasses – RwFlowbasedDecInfoTable – RwFlowBasedDecInfoRequestPriority
Reservation Holding Time	–
Resource Control Session Information	–
Dynamic firewall working mode	RwServiceInfoClasses – RwFlowFirewallModeIndicationTable – RwFlowFirewallModeIndication
Charging correlation information	RwDecInfoClasses – RwAppChrgInfoTable – RwAppChrgInfoValue RwReportClasses – RwRprtBearChrgInfoTable – RwRprtBearChrgInfoChrgId
PD-FE Identifier	
Resource Control Session Identifier	Client Handle(Object)
Resource Requestor Identifier	
Resource Request Priority	RwDecInfoClasses – RwFlowbasedDecInfoTable – RwFlowBasedDecInfoRequestPriority
Reservation Holding Time	–
Resource Control Session Information	–
Dynamic firewall working mode	RwServiceInfoClasses – RwFlowFirewallModeIndicationTable – RwFlowFirewallModeIndication
Resource Requestor Identifier	
Resource Request Priority	RwDecInfoClasses – RwFlowbasedDecInfoTable – RwFlowBasedDecInfoRequestPriority
Reservation Holding Time	–
Resource Control Session Information	–
Dynamic firewall working mode	RwServiceInfoClasses – RwFlowFirewallModeIndicationTable – RwFlowFirewallModeIndication

Table II.1 – Rw stage 2 message parameters to COPS Object-PIB-PRC-Attribute mapping

Rw Stage 2 Message Parameter	Object/PIB-PRC-Attribute
Resource Requestor Identifier	
Resource Request Priority	RwDecInfoClasses – RwFlowbasedDecInfoTable – RwFlowBasedDecInfoRequestPriority
Reservation Holding Time	–
Resource Control Session Information	–
Dynamic firewall working mode	RwServiceInfoClasses – RwFlowFirewallModeIndicationTable – RwFlowFirewallModeIndication
Resource Requestor Identifier	
Resource Request Priority	RwDecInfoClasses – RwFlowbasedDecInfoTable – RwFlowBasedDecInfoRequestPriority
Reservation Holding Time	–
Charging correlation information	RwDecInfoClasses – RwAppChrgInfoTable – RwAppChrgInfoValue RwReportClasses – RwRprtBearChrgInfoTable – RwRprtBearChrgInfoChrgId
Media Profile	RwServiceInfoClasses – RwFlowDescTable
Media Number	RwServiceInfoClasses – RwFlowDescTable (Position of the current PRID in the list)
Network Class of Service	RwDecInfoClasses – RwNetworClassTable – RwNetworkClass
Media Priority	RwDecInfoClasses – RwFlowbasedDecInfoTable – RwFlowBasedDecInfoRequestPriority
Path Selection Information	RwServiceInfoClasses – RwMPLSConnectInfoTable/ RwVSWITCHConnectInfoTable
Media Flow Description	RwServiceInfoClasses – RwSingleFlowInfoTable
Flow direction	RwServiceInfoClasses – RwFlowInfoTable – RwFlowInfoDirection
Flow Number	RwServiceInfoClasses – RwSingleFlowInfoTable – RwSingleFlowInfoFlowId
Gate Status	RwServiceInfoClasses – RwFlowInfoTable – RwFlowInfoFilterStatus
Protocol Version	RwServiceInfoClasses – RwFilterTable – RwFilterDstAddrType/RwFilterSrcAddrType
IP Addresses	RwServiceInfoClasses – RwFilterTable – RwFilterDstAddr/RwFilterSrcAddr
Ports	RwServiceInfoClasses – RwFilterTable – RwFilterDstL4PortMin/RwFilterDstL4PortMax/RwFilterSrcL4PortMin/ RwFilterSrcL4PortMax
Protocol Number	RwServiceInfoClasses – RwFilterTable – RwFilterProtocol
Bandwidth	RwServiceInfoClasses – RwFluxInfoTable – RwFluxInfoPeakBandwidth/RwFluxInfoAverageBandwidth
IP QoS handling class	RwServiceInfoClasses – RwFilterTable – RwFilterDscp
Traffic Descriptor	RwServiceInfoClasses – RwFluxInfoTable/ RwVSWITCHFluxInfoTable
Physical Connection Identifier	RwReqInfoClasses – RwReqInfoTable

**Table II.1 – Rw stage 2 message parameters to COPS
Object-PIB-PRC-Attribute mapping**

Rw Stage 2 Message Parameter	Object/PIB-PRC-Attribute
Logical Connection Identifier	–
Resource Reservation Mode	–
Event Notification Indication	RwEventInfoClasses – RwEventIndicatorTable – RwEventIndicator
Resource Information Indicator	RwEventInfoClasses – RwEventIndicatorTable – RwEventIndicator
Transport Loss Indicator	RwEventInfoClasses – RwEventIndicatorTable – RwEventIndicator(Value=Indication_of loss of bearer)
Transport Recovery Indicator	RwEventInfoClasses – RwEventIndicatorTable – RwEventIndicator(Value=Indication of recovery of bearer)
Transport Release Indicator	RwEventInfoClasses – RwEventIndicatorTable – RwEventIndicator(Value= Indication of Release of bearer)
NAPT control and NAT traversal	RwDecInfoClasses – RwNatActionTable
Address Binding Information Request	RwServiceInfoClasses – RwFlowInfoTable – RwFlowInfoFilter
Address Translation Command	RwDecInfoClasses – RwNatActionTable – RwNatAction
Address Binding Information Response	RwServiceInfoClasses – RwFlowInfoTable – RwFlowInfoFilter
Resource Request Result	RwReportClasses – RwStateReportTable – RwStateReportStatus or Report – Type(Object)
Authorization Token	RwReqInfoClasses – RwReqBindingTokenTable – RwReqBindingTokenValue
Timestamp	–
Reason	Reason(Object)

Bibliography

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