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Framework for Policy Usage Feedback for Common Open Policy Service with Policy Provisioning (COPS-PR)

Status of this Memo

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Abstract

Common Open Policy Services (COPS) Protocol (RFC 2748), defines the capability of reporting information to the Policy Decision Point (PDP). The types of report information are success, failure and accounting of an installed state. This document focuses on the COPS Report Type of Accounting and the necessary framework for the monitoring and reporting of usage feedback for an installed state.

Conventions used in this document

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

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Glossary

COPS - Common Open Policy Service. See [RFC2748].
 COPS-PR - COPS Usage for Policy Provisioning. See [RFC3084].
 PDP - Policy Decision Point. See [RFC2753].
 PEP - Policy Enforcement Point. See [RFC2753].
 PIB - Policy Information Base. The database of policy information.
 PRC - Provisioning Class. A type of policy data.
 PRI - Provisioning Instance. An instance of a PRC.
 QoS - Quality of Service.

1 Introduction

Policy usage reported by the PEP makes a richer set of information available to the PDP for decision-making. This feedback on policy usage can impact future decisions made by the PDP and the resulting policy installed by the PDP at the PEP. For example, a PDP making policy for a SIP signaled multimedia session may need to base the decision in part on usage information related to previously installed QoS policy decisions. Furthermore, the PDP may coordinate this usage information with other external systems to determine the future policy such as the case with the PDP coordinating multimedia session QoS and clearinghouse authorizations [SIP-AAA-QOS].

The scope of this document is to describe the framework for policy usage monitored and reported by the PEP and collected at the PDP. The charging, rating and billing models, as well as other accounting or statistics gathering events, detectable by the PDP are beyond the scope of this framework.

2 Overview

There are three main aspects to define policies for usage feedback:

- which objects are monitored
- the metrics to be monitored and reported for these objects
- when the reports are delivered

In the framework, a selection criteria policy specifies one or more objects that should be monitored (e.g., a dropper or the instances of an IP Filter for all its interfaces).

A usage feedback class is used to specify which metrics are to be collected for a set of objects - instances of the specified class carry the usage information when it is reported. The valid combinations of monitored object classes and usage feedback classes are reported by the PEP as capabilities.

Finally, selection criteria policy and usage feedback class are bound together in a linkage policy, which also contains the information of when reports are generated. Reports are usually sent periodically, but more restrictions can be placed on the generation of reports, like thresholds or a change in the data.

3 Requirements for Normal Operations

Per COPS [RFC2748], the PDP specifies the minimum feedback interval in the Accounting Timer object that is included in the Client Accept message during connection establishment. This specifies the maximum frequency with which the PEP issues unsolicited accounting type report messages. The purpose of this interval is to pace the number of report messages sent to the PDP. It is not the goal of the interval defined by the ACCT Timer value to provide precision synchronization or timing.

The selection and the associated usage criteria and intervals for feedback reporting are defined by the PDP. Feedback policies, which define the necessary selection and linkages to usage feedback criteria, are included by the PDP in a Decision message to the PEP. The usage feedback is then periodically reported by the PEP, at intervals defined in the linkage policies at a rate no more frequently than specified in the Accounting Timer object. Note that

there are exceptions where reports containing feedback are provided prior to the Accounting Timer interval (see section 6). The PDP may also solicit usage feedback which is to be reported back immediately by the PEP. Usage information may be cleared upon reporting. This is specified in the usage policy criteria.

The PEP monitors and tracks the usage feedback information. The PDP is the collection point for the policy usage feedback information reported by the PEP clients within the administrative domain. The PDP may also collect other accounting event information that is outside the scope of this document.

4 Periodic Nature of Policy Usage Feedback

Generally the policy usage feedback is periodic in nature and the reporting is unsolicited. The unsolicited reports are supplied per the interval defined by the PDP. The periodic unsolicited reports are dictated by timer intervals and use a deterministic amount of network resources.

The PDP informs the PEP of the minimal feedback interval during client connection establishment with the Accounting Timer object. The PDP may specify feedback intervals in the specific usage feedback policies as well. The unsolicited monitoring and reporting by the PEP may be suspended and resumed at the direction of the PDP.

4.1 Reporting Intervals

The generation of usage feedback by the PEP to the PDP is done under different conditions that include feedback on demand, periodic feedback or feedback when a defined threshold is reached.

The periodic feedback for a usage policy can be further defined in terms of providing feedback if there is a change or providing feedback periodically regardless of a change in value.

The periodic interval is defined in terms of the Accounting Object, ACCT Timer value. A single interval is equal to the number of seconds specified by the ACCT Timer value. The PDP may define a specific number of intervals, which are to pass before the PEP provides the usage feedback for a specific policy in a report. When the ACCT Timer value is equal to zero there is no unsolicited usage feedback provided by the PEP. However, the PEP still monitors and tracks the usage per the PDP policy and reports it when the PDP solicits the feedback.

Reporting may be based on reaching a defined threshold value in the usage PRC.

The PDP may solicit usage feedback in the middle of an interval by sending a COPS decision message. The exact contents of the message are out of the scope of this framework document and need to be defined in a document that actually implements usage feedback using this framework.

The PEP, upon receiving a solicit decision from the PDP, shall provide the requested usage information and clear the usage information if the usage policy requires that the attribute be cleared after reporting. The PEP should continue to maintain the same interval schedule as defined by the PDP in the Accounting Timer object and established at client connection acceptance.

5 Suspension, Resumption and Halting of Usage Monitoring and Reporting

The PDP may direct the PEP to suspend usage feedback report messages and then at a later time instruct the PEP to resume the reporting of feedback. The PDP may also instruct the PEP to suspend the monitoring and tracking of usage which also results in the suppression of the feedback reports until the PDP later tells the PEP to resume the monitoring (and reporting). When the PDP suspends monitoring or suspends reporting, it also specifies whether the PEP is to provide an unsolicited feedback report of the current monitored usage of the affected usage policy. The PDP may suspend and resume monitoring and reporting for specific usage policies or for all of the usage feedback policies.

6 Solicited Feedback

There may be instances when it is useful for the PDP to control the feedback per an on-demand basis rather than a periodic basis. The PDP may solicit the PEP for usage feedback with a Decision. The PDP may solicit usage feedback at any time during the accounting interval defined by the ACCT Timer. The PEP responds immediately and reports the appropriate usage policies and should continue to follow the usage feedback interval schedule established during connection acceptance.

7 Usage reports on shared objects

While some objects in a context's namespace directly represent unique objects of the PEP's configuration, other COPS objects can be shared between multiple actual assignments in the PEP.

Whenever the PEP creates multiple actual configuration instances from the same COPS objects, these assignments can potentially collect their own statistics independently. Since the individual assignments do not have a direct representation as COPS objects, additional information must be provided to uniquely identify the assignment that generates the usage information. As an example, if the PEP needs to create multiple usage objects for an IP address, it may use the port number to uniquely identify each object, i.e., the (IP address, port number) combination is now the unique identifier of the object.

The feedback framework allows this information to be distributed between a selection criteria PRC and the corresponding usage feedback PRC, however both PRCs together always must contain sufficient information for the finest granularity of usage collection supported by the PEP.

If all the additional information is not part of the selection criteria PRC, all matching assignments are selected to collect usage information. The necessary data to differentiate these assignments is part of the usage feedback PRC.

Implementations based on the feedback framework should always provide a selection criteria PRC that contains a complete set of information to select a unique assignment, while underspecified selection criteria PRCs (together with extended usage feedback PRCs) are optional.

8 Context

COPS-PR [RFC3084] allows multiple, independent, disjoint instances of policies to be configured on the PEP. Each instance is known as a context, and only one context can be active at any given moment. The PDP directs the PEP to switch between contexts using a single decision message.

The monitoring and recording of usage policies is subject to context switches in a manner similar to that of the enforcement policy. Usage policy is monitored, recorded and reported while the associated policy information context is active. When the context is deactivated, a report message containing the usage feedback policies for that context is provided to the PDP. The PEP does not perform any monitoring, tracking or reporting of policy usage for a given context while the context is inactive.

9 Delete Request States

The PEP MUST send any outstanding usage feedback data monitored during the feedback interval to the PDP via an unsolicited report message immediately prior to issuing a Delete Request State. This is also the case when the PDP initiates the Delete Request State.

10 Failover

In the event the connection is lost between the PEP and PDP, the PEP continues to track usage feedback information as long as it continues to enforce installed (cached) policy. When the locally installed policy at the PEP expires, the usage feedback policy data also expires and is no longer monitored.

Upon successful reconnection, where the PEP is still caching policy, the PDP indicates deterministically to the PEP that the PEP may resume usage feedback reporting. The PEP reports all cached usage and resumes periodic reporting, making any needed adjustment to the interval schedule as specified in the reconnection acceptance ACCT Timer.

11 Security Considerations

This document provides a framework for policy usage feedback, using COPS-PR as the transport mechanism. As feedback information is sensitive, it MUST be transported in a secured manner. COPS [RFC2748] and COPS-PR [RFC3084] provide for such secured transport, with mandatory and suggested security mechanisms.

The usage feedback information themselves MUST be secured, with their security requirement specified in their respective documents.

12 References

12.1 Normative References

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