



# **Policy Evaluation, Enforcement and Management Architecture**

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# 1. Scope

**(Informative)**

This document provides the architecture for the Policy Evaluation, Enforcement and Management (PEEM) enabler of OMA.

The PEEM enabler evaluates and/or enforces policies. Policies are applied to requests to, or responses from resources or, when explicitly called by a resource.

The architecture shown in this document is intended to facilitate the development of specifications for defining, managing, evaluating, and enforcing policies in a way that is scalable and flexible yet independent of any specific implementation scheme. Additionally, the architecture enables reuse by other enablers so that their requirements are satisfied.

Note also that this enabler does not specify individual policies, but rather addresses requirements on how to express policies.

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## 3. Terminology and Conventions

### 3.1 Conventions

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 [**Error! Reference source not found.**].

All sections and appendixes, except “Scope” and “Introduction”, are normative, unless they are explicitly indicated to be informative.

### 3.2 Definitions

For the purposes of the present document, the terms and definitions given in [OMA-DICT] and the following apply:

<b>Delegate</b>	A delegate is a designated resource that performs specified tasks or functions on behalf of (one or more) other resources. To <i>delegate</i> is to designate a resource to perform specified tasks or functions on behalf of (one or more) other resources.
<b>Policy</b>	An ordered combination of policy rules that defines how to administer, manage, and control access to resources [Derived from [RFC 3060], [RFC 3198] and [RFC 3460]].
<b>Policy Action</b>	Action (e.g. invocation of a function, script, code, workflow) that is associated to a policy condition in a policy rule and that is executed when its associated policy condition results in "true" from the policy evaluation step.
<b>Policy Condition</b>	A condition is any expression that yields a Boolean value.
<b>Policy Enforcement</b>	The process of executing actions, which may be performed as a consequence of the output of the policy evaluation process or during the policy evaluation process.
<b>Policy Evaluation</b>	The process of evaluating the policy conditions and executing the associated policy actions up to the point that the end of the policy is reached.
<b>Policy Management</b>	The act of describing, creating, updating, deleting, provisioning and viewing policies.
<b>Policy Processing</b>	Policy evaluation or policy evaluation and enforcement
<b>Policy Rule</b>	A combination of a condition and actions to be performed if the condition is true
<b>Request</b>	An articulation of the need to access a resource (e.g. asynchronous events).
<b>Requestor</b>	Any entity that issues a request to a resource.
<b>Resource</b>	Any component, enabler, function or application that can receive and process requests.

### 3.3 Abbreviations

For the purposes of the present document, the abbreviations given in [OMA-DICT] and the following apply:

<b>LDAP</b>	Lightweight Directory Access Protocol
<b>PDP</b>	Policy Decision Point
<b>PEP</b>	Policy Enforcement Point
<b>PEF</b>	PEEM/Policy Evaluation and Enforcement
<b>PM</b>	PEEM/Policy Management
<b>PoC</b>	Push to talk over Cellular
<b>PV</b>	PEEM/Policy Evaluation
<b>PF</b>	PEEM/Policy Enforcement
<b>XCAP</b>	XML Configuration Access Protocol

**XDM** XML Document Management  
**XPATH** XML Path Language

## 4. Introduction (Informative)

Service environments where different entities, e.g. enterprises, network operators, service providers and 3rd party service providers collaborate to provide highly personalised services to subscribers present new opportunities and benefits to the industry. The specification of the Policy Evaluation, Enforcement and Management (PEEM) enabler is driven by the need to reduce management complexity whilst introducing consistent new subscriber services with the same or reduced time to market.

Policies are formalisms that are used to express business, engineering or process criteria represented by a combination of policy conditions and actions. PEEM specifies ways to convey and enforce policies that can be used to manage resources, processes, and underlying systems. OMA enablers are expected to re-use the PEEM specifications in order to avoid duplication and misalignment. The aim of this document is to define the architecture of the PEEM enabler.

PEEM also enables the delegation of responsibility to other resources:

- This can help avoid the costly duplication of functionality across service enablers and reduce the proliferation of 'silos' in service provider domains.
- This is expected to be an efficient mechanism to re-use resources by providing a systematic way to express and implement the delegation to such other resources.

Policies can be associated with target resources, and/or requestors and/or requests/responses; this list is not exhaustive.

OSE dictates that whenever requests are made to a resource, the associated policies are evaluated and enforced by a policy enforcement mechanism on the request and/or on the associated response. The PEEM enabler can be used to perform these operations.

The PEEM enabler can be used as a function that can be explicitly called by other resources or act as a proxy..

This architecture document is neutral in terms of implementation and deployments.

### 4.1 Planned Phases

All the PEEM requirements are planned to be fully met in this release. No future releases are currently planned.

### 4.2 Security Considerations

The PEEM enabler can be applied according to two usage patterns (callable and proxy usage pattern). In both usage patterns, interaction with the PEEM enabler implementation may be within the same domain or between different domains, and the resources that interact with the PEEM enabler implementation may differ per usage pattern;

- in the proxy usage pattern the Target Resource Requestor may reside in the same domain as the PEEM enabler domain and security measures should be considered that allow for secure intradomain exchanges. Alternatively the Target Resource Requestor may reside in a different domain from the PEEM enabler domain hence security measures should be considered that allow for secure interdomain exchanges. The intercepted Target Resource Requests may need security, e.g. web services security.
- in the callable usage pattern the PEEM enabler can be explicitly called by an Evaluation Requestor (see Section 5) that may reside in the same domain as the PEEM enabler domain and security measures should be considered that allow for secure intradomain exchanges between Evaluation Requestor and PEEM enabler. Alternatively the Evaluation Requestor may reside in a different domain from the PEEM service enabler domain hence security measures should be considered that allow for secure interdomain exchanges between Evaluation Requestor and the PEEM enabler.

Note that different domains may imply: different administrative domains, different security domains and/or the need to traverse insecure networks between the domains.

In both usage patterns the PEEM service enabler may delegate to (i.e. make a request to) other enablers such as a charging enabler. These other (delegated to) enablers may or may not reside in different security or

administrative domains and appropriate security measures should be considered for each case. In particular, it is important to be able to ensure that the different systems (PEEM, delegated resources and target resources) get access only to the information that they need to know to perform their functions (e.g. payment details are not made available to authentication resource etc.). Appropriate key management and selective encryption when delegating functions may be required and may be specified by the policies.

In both usage patterns the PEEM enabler policies are managed (i.e. create, modify, view, delete policies) through the management interface PEM-2. Various management actors such as network operator and end-user (i.e. Management Requestors, see Section 5) must be supported and appropriate associated security measures need to be applied: it should be possible to authenticate Management Requestors (see section 5), e.g. principles authorised by service provider or third party or an end user) and secure the PEM-2 exchanges for both the intradomain and the interdomain case.

## 5. Architectural Model

PEEM Architecture is defined by its interfaces and its behavior is driven by the policies written in a policy expression language. PEEM specifications include two interfaces (one for management and one for policy processing) and a policy expression language. With respect to the interactions between PEEM and other resources, two PEEM usage patterns have been identified (callable usage pattern and proxy usage pattern). PEEM architecture diagram, PEEM behavior in different usage patterns and PEEM components, interfaces and policy expression language will be described in the following sections.

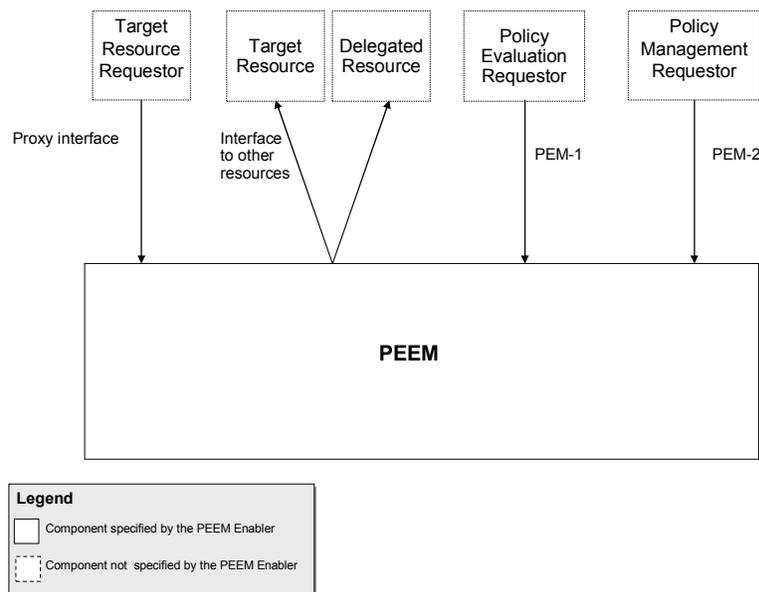
### 5.1 Dependencies

No dependencies identified.

### 5.2 Architectural Diagram

This section contains architectural diagrams that illustrate PEEM logical components, interfaces and relationships it has with other entities in the OSE.

This document will describe in further detail the logical components and interfaces from the PEEM enabler perspective.



**Figure 1. PEEM Enabler architecture**

Note that PEEM enabler implementation can evaluate and enforce policies when exposing any resource (e.g. application, enabler, component, function).

For both proxy and callable usage patterns, PEEM may interact with other resources.

A proxy interface supports the PEEM proxy usage pattern (see Figure 2).

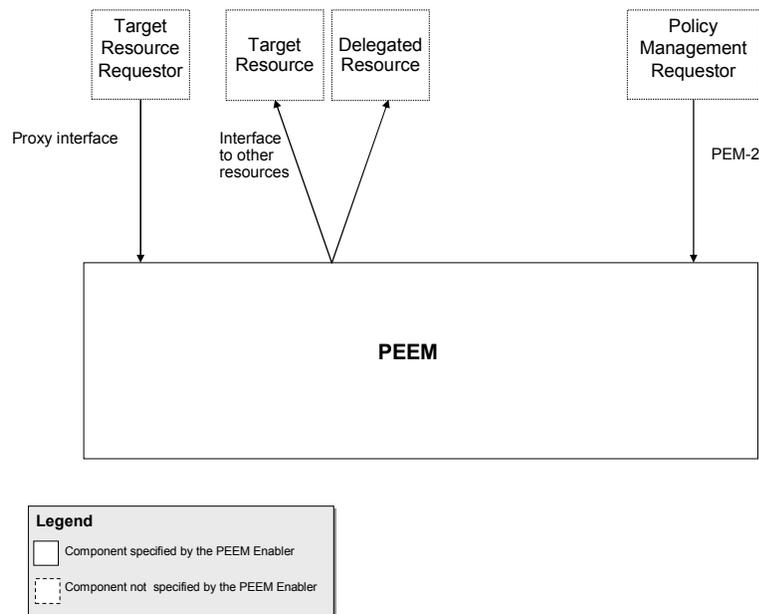


Figure 2. PEEM enabler proxy usage pattern

In the callable usage pattern (see Figure 3), PEEM can act as a Policy Decision Point (PDP), as described in the IETF PEP-PDP model [RFC 2753] (see also section 5.7 and Appendix G).

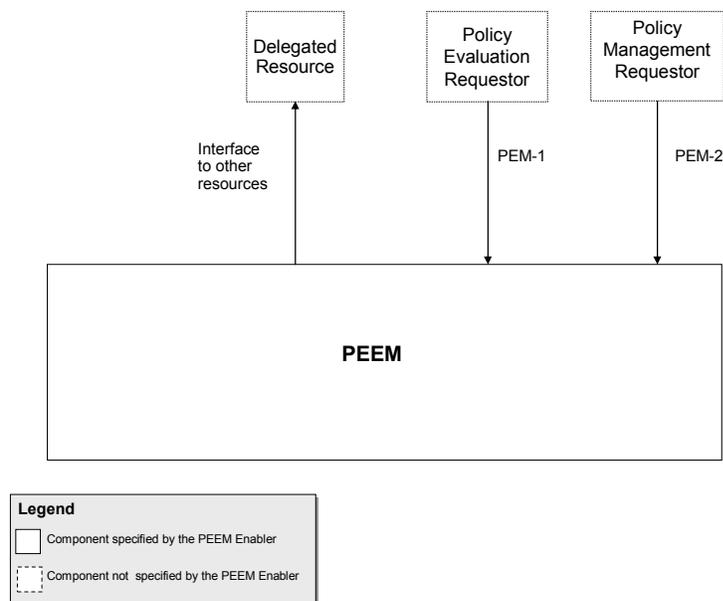


Figure 3. PEEM enabler callable usage pattern

## 5.3 Functional Components and Interfaces

This section describes the functional components and interfaces identified in Figure 1. The components and interfaces specified by PEEM are loosely coupled, in the sense that the specification for each of them does not have to be tightly coupled with the specification of the others.

The PEEM enabler exposes the following interfaces:

- PEM-1 (PEEM specified callable interface)
- PEM-2 (PEEM specified management interface)
- Proxy interface (used for intercepting requests to target resources)

### 5.3.1 PEEM (Policy Evaluation, Enforcement and Management component)

PEEM has the following features:

- identifies the policies associated with the request. Policies contain policy rules (see definitions for Policy and Policy Rule)
- processes the policy, i.e. goes through the following steps:
  - evaluates policies using messages received and other context information (see definition for Policy Evaluation, Policy Rule and Policy Condition). The component may delegate to other resources where appropriate
  - executes the policy actions resulting from a positive evaluation of the policy conditions. The component may use delegation to other resources where appropriate, and
  - may return, after completing all previous processing, a policy decision to a requestor or may allow a request to continue to its original target destination. A request for policy processing can arrive to PEEM either as a direct request for support from another entity (see also the section describing PEEM specified callable interface) or as a request from another entity to another resource, proxied (or intercepted) by PEEM (see also the section describing PEEM proxy usage pattern). In the first case, the policy processing may complete by returning a policy decision to the requesting resource (See also 5.7.1 and 5.7.4) or perform enforcement itself (see also 5.7.5). When a policy decision is returned to a resource, that resource is in control of deciding how to handle the rendered decision. In the second case, the policy processing completes by forwarding the original request to the destination resource (if the processing resulted into a “pass” condition) or by returning an error to the originating entity (if the processing resulted into a “fail” condition)
- provides the functions of describing, creating, updating, deleting, provisioning and viewing of policies.

### 5.3.2 Proxy Interface

The Proxy interface is not specified by PEEM, but is used to exchange messages compliant to the target enablers or more generally messages compliant to combination of the target resource interface and the set of parameters that must be added to requests through that resource’s interface, as required to satisfy policies that are to be processed when exposing the resource. The messages exchanged through this interface may be different for each target resource.

### 5.3.3 PEM-1 (PEEM specified callable interface)

The PEM-1 interface is used by other resources to make a direct request for policy processing. PEEM processes the request and may return a policy decision (the result of the policy evaluation) to the originating resource, using the same interface, see also 5.7.4. Alternatively, it may also perform policy enforcement and possibly return no value to the requester, see also 5.7.5.

PEM-1 is defined in a way that permits other enablers to particularize the PEM-1 interface in order to satisfy their requirements.

### 5.3.4 PEM-2 (PEEM specified management interface)

The PEM-2 interface is used by other resources to make a request for policy management. This interface is also referred to as PEEM management interface.

## 5.4 Other components and interfaces

In addition to PEEM components and interfaces, there are other elements represented in Figure 1 for a better understanding of the architectural diagram. The following is a list of other elements identified in Figure 1 that interact with PEEM:

- Target Resource Requestor
  - Target Resource Requestor represents a resource (e.g. application, enabler) that issues a request to a target resource.
- Target Resource
  - Target Resource represents the destination resource for a request made by another resource.
- Delegated Resource
  - Delegated Resource represents the resource to which PEEM may delegate certain policy actions during the policy processing process.
- Evaluation Requestor
  - Evaluation Requestor represents a resource (e.g. application, enabler) that issues a request for policy processing to PEEM.
- Management Requestor
  - Management Requestor represents a resource (e.g. application, enabler) that issues a request for policy management to PEEM.
- Interface to other resources
  - The interface to other resources is not specified by PEEM, but is used to exchange messages compliant to the interface of the target or delegated enablers or more generally messages compliant to the target or delegated resource interfaces. The messages exchanged through this interface may be different for each resource. The “Proxy Interface” and the “Interface to other resources” have similar properties and behavior.

## 5.5 Flows

PEEM usage patterns are introduced in Section 5.2. This section describes the high-level logical flows for the PEEM proxy usage pattern and the PEEM callable usage pattern. In addition, this section describes the policy management flow.

### 5.5.1 PEEM Proxy Usage Pattern Flow

Figure 4 illustrates the logical flows of the PEEM enabler in the proxy usage pattern.

In the PEEM proxy usage pattern the Target Resource Requestor issues a request to the Target Resource (flow #1).

The request is intercepted by the PEEM enabler (acting as a Target Resource proxy in the proxy usage pattern). Upon interception of the request the PEEM enabler identifies the relevant policy and starts the process of evaluating and enforcing it. In that process it may issue requests to one or more Delegated Resources that perform certain expected functions (flow#2) and deal with the results of the delegated functions that are returned to the PEEM enabler (flow#3). Based on a policy that evaluates the returned results the PEEM enabler may again issue requests to one or more Delegated Resources (flow#4) and deal with the results (flow#5).

The Target Resource returns a result (flow#7) which is intercepted by the PEEM enabler (acting as a Target Resource Requestor proxy in the proxy usage pattern). Upon interception of the result (flow#7) the PEEM enabler identifies the relevant policy and starts the process of evaluating and enforcing it. In that process it may issue requests to one or more Delegated Resources that perform certain expected functions (flow#8) and deal with the results that are returned to the PEEM enabler (flow#9). Based on the policy that evaluates the returned results the PEEM enabler may again issue requests to one or more Delegated Resources (flow#10) and deal with the results (flow#11).

The PEEM enabler passes the result, if appropriate, on to the Target Resource Requestor (flow#12).

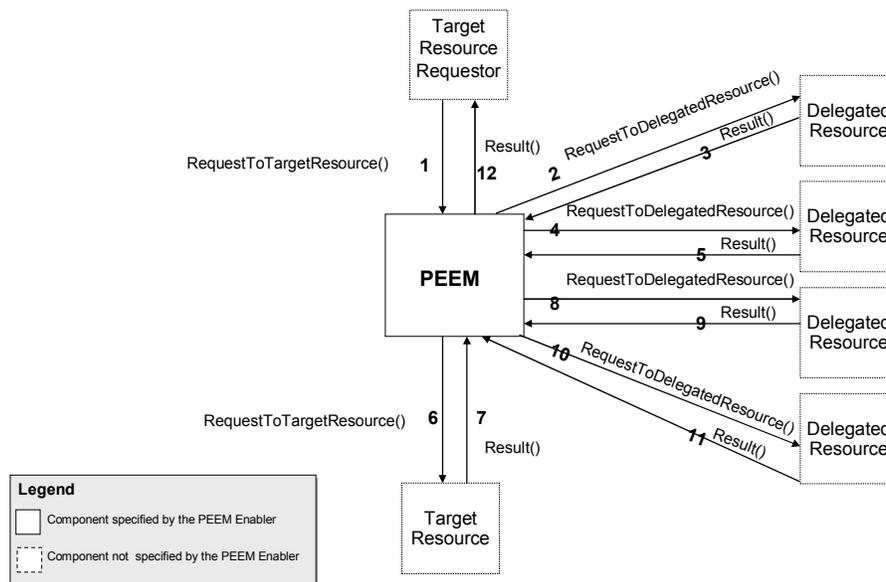


Figure 4. Logical Flow for PEEM proxy usage pattern

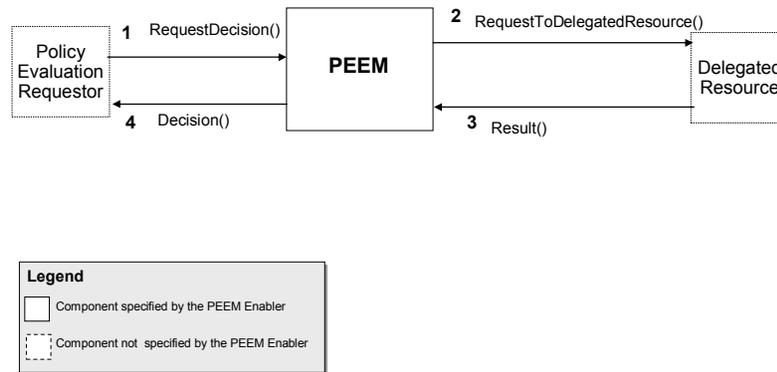
### 5.5.2 PEEM Callable Usage Pattern Flow

Figure 5 illustrates the logical flows of the PEEM enabler in the callable usage pattern.

In the PEEM callable usage pattern the Evaluation Requestor issues a request for Policy processing (flow #1) to the PEEM enabler using the PEM-1 interface.

Upon reception of the request the PEEM enabler identifies the relevant policy and starts the process of evaluating it. In that process it may issue requests to one or more Delegated Resources that perform certain expected functions (flow#2) and may deal with the results (flow#3) that are returned to the PEEM enabler. Such delegated resources can be enablers or other resources.

A decision is reached when the policy evaluation completes. The PEEM enabler then returns the decision (flow #4) to the Evaluation Requestor or performs enforcement itself, possibly without returning a value to the requester, see also 5.7.4 and 5.7.5. Upon reception of the decision the Evaluation requestor executes its own actions as dictated by the decision.



**Figure 5. Logical Flow for PEEM callable usage pattern**

### 5.5.3 PEEM Policy Management Flow

Figure 6 illustrates the logical flows of the PEEM enabler for management of policies.

In the PEEM management flow the Management Requestor issues a request for Policy Management (flow #1 in Figure 6) to the PEEM enabler, through the PEM-2 interface. Upon reception of the request the PEEM enabler identifies the type of policy management request (e.g. create, delete, view, modify), executes the appropriate function and returns the results to the Management requestor (flow #2 in Figure 6).

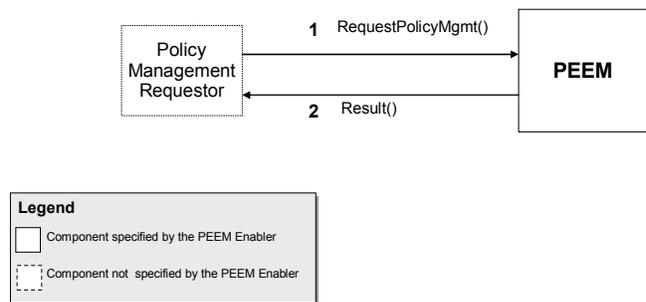


Figure 6. Logical Flow for PEEM policy management

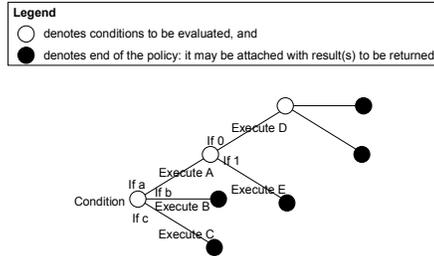
## 5.6 Policy Expression Language

### 5.6.1 PEEM Policy information model

By definition, policies are combinations of policy rules, each of which is defined as a policy condition and actions (i.e., IF condition THEN action).

Evaluation may involve arbitrary computations. The conditions and actions in policy rules may require the execution of arbitrary functions that include delegation to OMA enabler implementations.

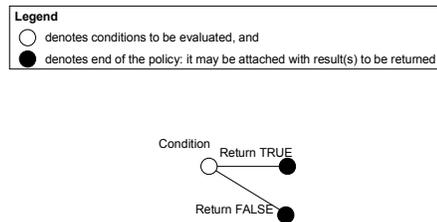
The topology of a policy is defined as a graph where each node represents a condition to be evaluated and each outbound branch has actions to be executed if the corresponding condition is true. This is illustrated in Figure 7.



**Figure 7. An Example of a graph that describes the topology of a policy (composed of multiple policy rules).**

There are 2 execution models described by the IETF policy model defined in RFC 3060 [RFC 3060], one model has a single condition at each node. The second model permits case statements on the nodes where each includes a priority that determines the order of evaluation of these simple conditions.

As mandated in [PEEM-RD], PEEM can also be used to perform only policy evaluation without executing any policy actions or performing any enforcement. The case of a simple condition is illustrated by Figure 8



**Figure 8. Example of evaluation only policy without execution of any policy actions or enforcement by PEEM**

Note again that branching from a node is not limited to 2 branches (e.g. “case of”).

The topology of a policy graph can be changed in numerous ways without changing the result of its evaluation or enforcement. This may of course modify the policy conditions and actions from one graph to another equivalent graph.

The policy to be used by PEEM for any invocation of PEM-1 may be provided as part of the call to PEEM by passing the policy (or a reference) that must be processed.

## 5.6.2 Properties of an appropriate policy expression language

A suitable policy expression language must satisfy the following requirements:

- It is capable of expressing any combination of policy conditions and actions. In particular:
  - It is powerful enough to specify any calculation within a condition or an action
  - It can support delegation
  - Can perform pattern matching on input data
  - Can specify the format of output data
- Does not preclude any policy topology.

To clarify further, the language may be more easily adopted and deployed if the following options are provided:

- It provides constructs (e.g. function call) to facilitate interface transformation or generation of a new binding.
- It is capable of expressing OMA existing and/or future policy conditions and actions such as (for example):
  - Encryption strength must be 128kbits
  - Authentication is required
  - Rating must be checked and charging performed before passing the request
  - Subscribers must have a minimum amount in their account

## 5.7 Mapping IETF PEP-PDP model to the PEEM model (informative)

### 5.7.1 Essence of the PEP/PDP behavior

Considering the information contained in the sections above, we can conclude that the core of the PEP/PDP behavior that should be supported by PEEM, is the following:

PEP behavior:

- Identifying requests that need an external authorization decision
- Ability to request for external authorization decision
- Enforcing the decision taken in the external authorization function

PDP behavior:

- Receiving a request for taking a decision over an authorization
- Identify relevant policy and take a decision
- Return the decision

- May call delegated resources as part of the evaluation (Not included in the figures below, see section 5.5.2)

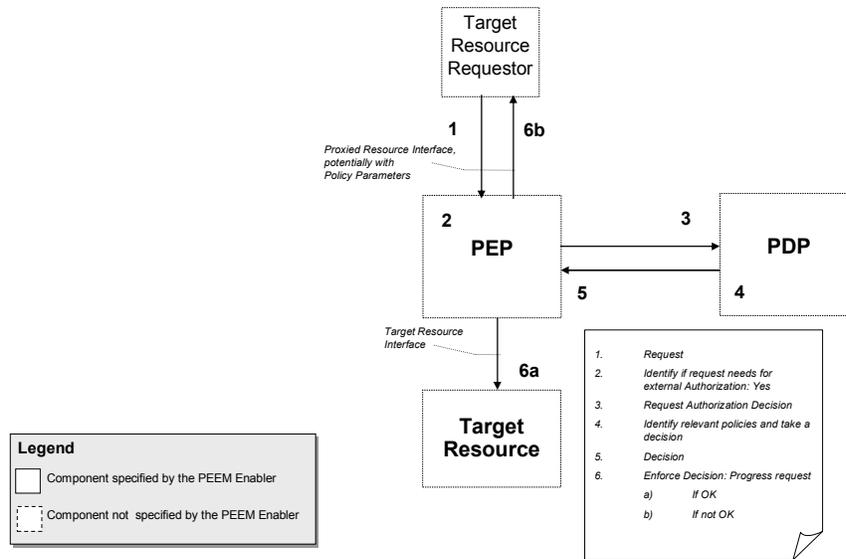


Figure 9. PEP/PDP model behavior

## 5.7.2 Recap of PEEM model

Utilizing the PEEM model for satisfying the PEP/PDP behavior as shown in previous sections may happen in at least two possible scenarios.

### 5.7.2.1 Using PEEM for PEP/PDP behavior – Scenario A

In this scenario, both ends of the flow are played by PEEM compliant elements.

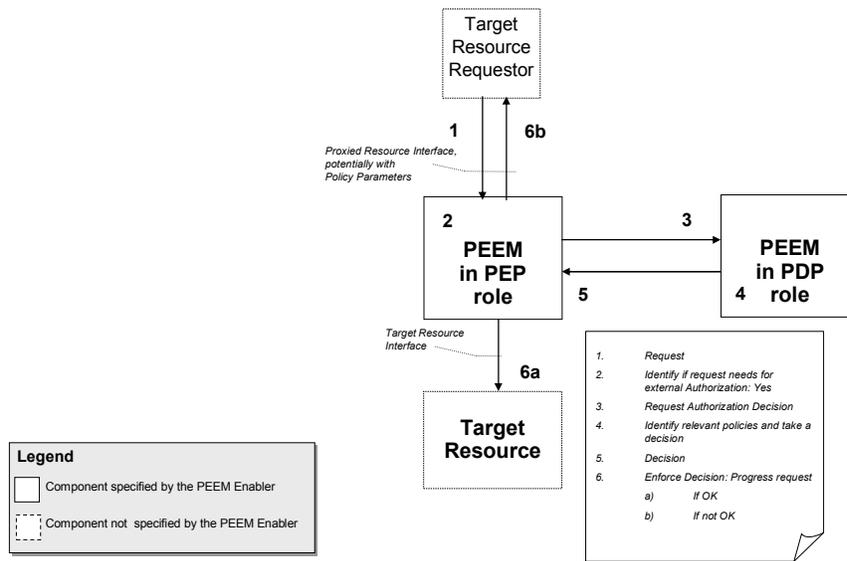


Figure 10. PEEM support for PEP/PDP behavior - Scenario A

When the proxy usage pattern is used, the complete policy enforcement cycle may be realized within one particular PEEM implementation. The case where one particular PEEM implementation provides the PEP and PDP roles at the same time is shown in Figure 11.

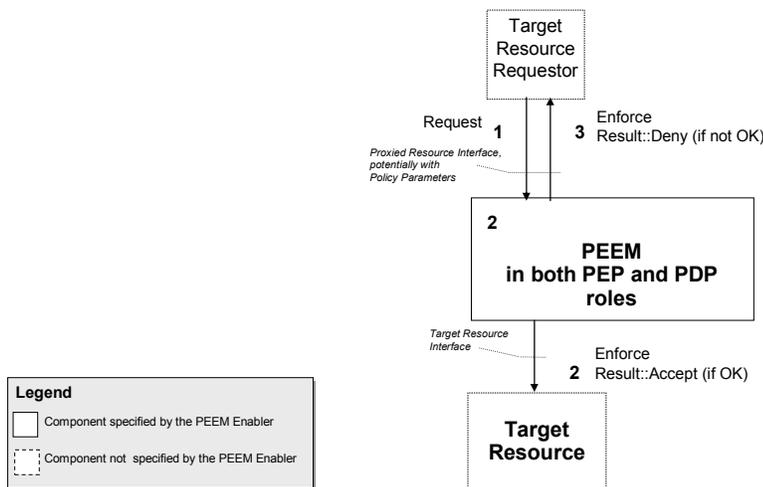
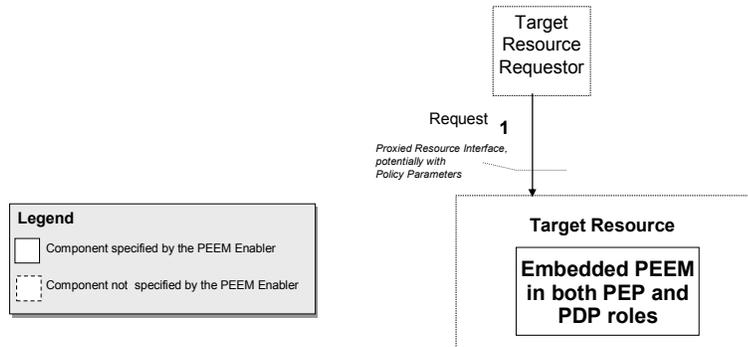


Figure 11 - PEEM support for PEP/PDP behavior in one particular PEEM implementation – Scenario A

Of course, following the guidelines already written in the PEEM AD and PEEM RD, other deployment options may exist for the PEP side, as illustrated in next picture (e.g.: some OMA WGs could decide to fully reutilize the PEEM specifications in their defined enablers); the essence is that the PEP role is played by PEEM functions.



**Figure 12. Different deployment options exist on the PEP side**

In this case, the functionality required for the PEP and PDP behaviors are supported by PEEM specifications.

### 5.7.2.2 Using PEEM for PEP/PDP behavior – Scenario B

In this scenario, the PEP functionality is realized by any resource. The mechanisms utilized by this resource to identify and to determine if external authorization is needed are outside the scope of PEEM.

PDP behavior is realized by PEEM.

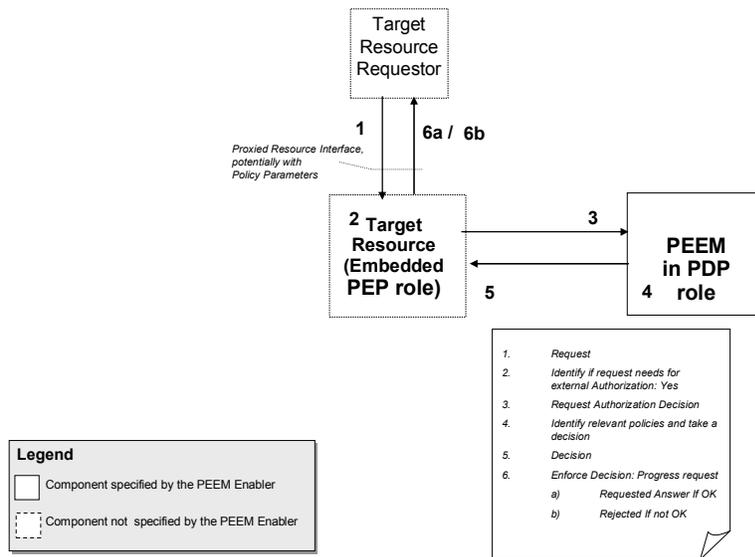


Figure 13. PEEM support for PEP/PDP behavior - Scenario B

The support for the PEP/PDP behavior in this scenario takes place in the following way.

As we said at the beginning of this section, PEP behavior (as stated in Section 5.7.1), is realized by the enabler in a way that is outside of the PEEM spec:

- It could be specified in an OMA enabler spec that reuses PEEM
- It could be done proprietarily by the legacy enabler
- It could be done by an ad-hoc programming
- Etc.

Additionally, please note that in the figure appears the label “Enabler With embedded PEP behavior”, but this could be in fact any kind of requester, e.g.: an application.

The PDP behavior (as stated in Section 5.7.1), is realized by the PEEM enabler based on its specs (interfaces defined, policy expression language defined, etc.)

The communications between both elements take place over the PEM-1 interface, where the decision can be of the nature "accept" or "deny" and in addition it can be of the nature of communicating a more complex decision with additional steps to be undertaken by the PEP (e.g. an outgoing message like "ask user consent").

### 5.7.3 Support for PEP/PDP behaviors: Impacts on PEEM model

#### Scenario A

In this case, the situation comes down to one PEEM implementation (realizing the PEP role) delegating the decision onto another PEEM implementation (implementing the PDP role):

- PEM-1 interface: Interface and protocol will give support to this “decision delegation” flow.
- PEEM enabler: needs to be able to satisfy PDP and PEP behaviors:
  - From PEP behavior

- Be able to identify which service requests need an external authorization decision.
- Be able to delegate the decision to an external PDP element.
- Being able to enforce the decision that was taken in an external PDP element.
- From PDP behavior:
  - Be able to receive decision requests when in callable mode.
  - Be able to identify relevant policy on decision requests coming through the PEM-1 interface, “calculate” a decision and return it, without having to enforce the decision (since in this PEP/PDP behavior, the enforcement of the decision would take place on the PEP side).
- PEEM policy expression language:
  - Needs to give support for defining policies for the PDP behavior (oriented to just give a decision).
  - Needs to give support for defining policies for the PEP behavior.
- PEM-2 interface: Interface and protocol will give support to to provision a kind of policies needed to support the PEP-PDP model.

### Scenario B

In this case, the requirements/impacts from supporting the PEP/PDP model fall on the following aspects:

- PEM-1 interface: Interface to request a decision using the PEEM enabler.
- PEEM enabler: needs to be able to satisfy PDP behavior:
  - Be able to receive requests in callable mode.
  - Be able to identify relevant policy on requests coming through the PEM-1 interface, “calculate” a decision and return it, without having to enforce the decision (since in this PEP/PDP behavior, the enforcement of the decision takes place on the PEP side).
- PEEM policy expression language:
  - Needs to give support for defining policies for the PDP behavior (oriented to just give a decision).

## 5.7.4 Mapping IETF PEP-PDP model to PEEM architecture

This section provides an explanation on how the IETF policy architecture maps to the PEEM architecture.

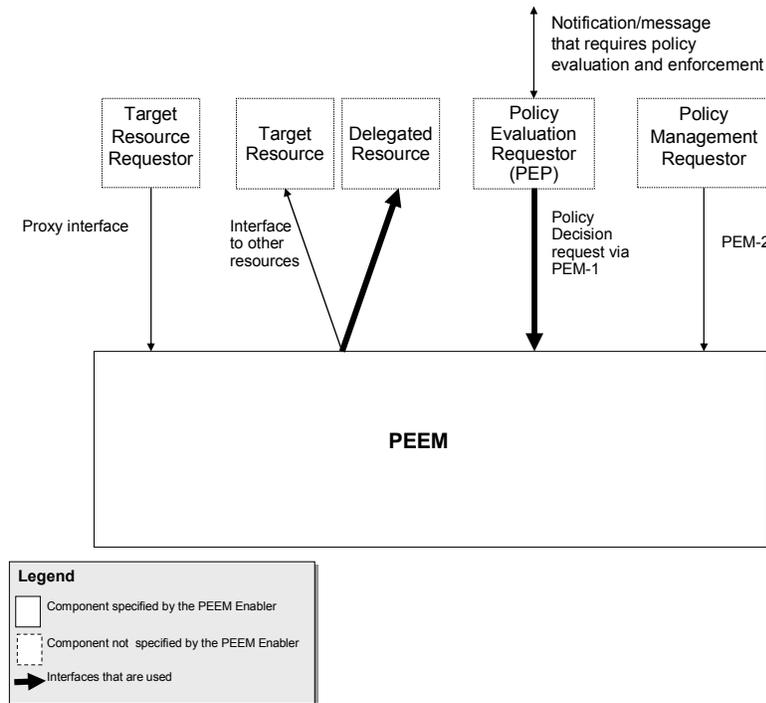
Disclaimer: while portions of the following text are copied from [\[RFC2753\]](#), they have been modified to show the mapping to the PEEM architecture, where appropriate. Taking into consideration the IETF model that is based on PEP and PDP components, the following table and text applies (copied from [\[RFC2753\]](#)):

**Table 1. IETF definitions**

IETF definitions <a href="#">[RFC3198]</a> <a href="#">[RFC2753]</a>
<b>Policy Decision Point (PDP)</b> A logical entity that makes policy decisions for itself or for other network elements that request such decisions <a href="#">[RFC2753]</a> .
<b>Policy Enforcement Point (PEP)</b> A logical entity that enforces policy decisions <a href="#">[RFC2753]</a> . The PEP enforces the policy decision by appropriately accepting or denying the request <a href="#">[RFC2753]</a> .

The basic interaction between the components begins with the PEP. The PEP (in Figure 14 the PEP is Evaluation Requestor) will receive a notification or a message that requires a policy decision. Given such an event, the PEP then formulates a request for a policy decision and sends it to the PDP (see Figure 14, PEM-1, PEP is Evaluation requestor for evaluation only). The PDP returns the policy decision (see Figure 14, PEM-1 to Evaluation requestor) and the PEP then enforces the policy decision by appropriately accepting or denying the request (Evaluation Requestor will continue its processing, in case of an accepted request). The PDP itself may make use of additional mechanisms and protocols to achieve additional functionality such as user authentication, accounting, policy information storage, etc. For example, the PDP is likely to use an LDAP-based directory service for storage and retrieval of policy information (see Figure 14, delegation via interfaces to other (Delegated) Resource).

Thus Figure 14 illustrates the case where the PEEM enabler performs evaluation only [PEEM-RD]. In the case of evaluation only, a PDP type of function is the only one involved. Typically this applies to a PEEM enabler in callable mode. A PEP (Evaluation Requestor) may request evaluation from various delegated PDPs (e.g. from a charging PDP, from a privacy PDP, from a regulatory PDP). The requestor (PEP) will then carry out the decision rendered by the PDP. The components that are “whited out” are not involved in the interactions, and the interfaces to those components are not used. The **bold** interfaces indicate which interfaces are used in this mapping, relevant to the PEEM architecture.



**Figure 14. Callable PEEM for evaluation only: PEP-PDP model when only the PDP is incorporated in PEEM**

In accordance with the IETF, PEEM may make use of additional mechanisms and protocols to achieve additional functionality. In the case of delegation to OMA enablers such delegations will be done through the enablers I0 interfaces. When the PEP function is performed outside PEEM, that function can also make use of delegation to other resources in the same way as described above.

### 5.7.5 PEEM features beyond the PEP/-PDP model

PEEM supports usage models beyond what is considered with the PEP-PDP model discussed above:

- The PEEM proxy mode is not modeled by the PEP-PDP model. However, it should be noted that a PEEM enabler implementation for usage in proxy mode may be implemented using PEP interceptors and PDP for policy evaluation.
- In PEEM callable mode, PEEM may support situations where the policies that are evaluated result into:
  - Returning no result to the requester, i.e. the calling resource will delegate the enforcement to PEEM. PEEM then handles the enforcement of the operation via the executed policy actions
  - Returning a result to another resource than the requester, i.e. the calling resource will delegate the enforcement to PEEM. PEEM then calls the other resource as a policy action.

In all these cases, enforcement may be considered to be performed as part of the policy evaluation, delegated by the calling entity/PEP. This explains why the definitions of policy enforcement in section 3.2 includes that enforcement may be performed by PEEM.

## Appendix A. Change History

(Informative)

### A.1 Approved Version History

Reference	Date	Description
n/a	n/a	No prior version –or- No previous version within OMA

### A.2 Draft/Candidate Version 1.0 History

Document Identifier	Date	Sections	Description
Draft Versions: OMA-ARC- AD_Policy_Evaluation_Enforcement_Management	15 Feb 2005	n/a	See OMA-ARC-2005-0078-PEEM-AD-Functional-Architecture
	12 Apr 2005	n/a	See OMA-ARC-2005-0086R02-PEEM-AD-Functional-Architecture-Sections-5.2-and-5.3., OMA-ARC-2005-0085-PEEM-AD-Definitions-and-Abbreviations, and corrected the figure cross reference and marked few opportunities for improvement
	14 Jun 2005	n/a	See OMA-ARC-2005-0176R02-PEEM_Beyond_enabler_Protection OMA-ARC-2005-0167R01_Acknowledging_PEM3_PEM4_Similarities OMA-ARC-2005-0198-PEEM_Beyond_enabler_Protection_figure_update Note: editor had to consolidate changes proposed in figure 1 in 198 with original of figure 1 in OMA-AD_Policy_Evaluation_Enforcement_Management-V1_0-20050412-D. Result of consolidation is temporary depicted as underlined text in a different font color. OMA-ARC-2005-0226R01-Following_up_0198
	15 Jun 2005	n/a	See OMA-ARC-2005-0208R04-LATE-PEEM-detailing-out-logical-functions Note: editor did some editorial updates.
	23 Aug 2005	n/a	See OMA-ARC-2005-0227R05-PEEM_policy_Expression_Language OMA-ARC-2005-0262-Remove-I2-from-PEEM-AD Note: editor did some editorial updates. OMA-ARC-2005-0261R03-Policy-Expression-Languages Added (informative) to appendix C Removed “comment text” style partially used in Appendix C Added missing and updated references OMA-ARC-2005-0254R04-PEEM-AD-5.3 Added an editor’s note to highlight inconsistency in section 5.2 OMA-ARC-2005-0255R04-PEEM-AD-5.3.2 OMA-ARC-2005-0256R03-PEEM-AD-5.3.2.2 OMA-ARC-2005-0283R02-Criteria-for-PEEM-Policy-Management-Interface Added as appendix D “Source material for consideration for PEM-2 interface specification” Removed inconsistency in D.1 Added references OMA-ARC-2005-0294R01-corrections-to-PEEM-AD
	17 oct 2005	n/a	See OMA-ARC-2005-0354-PEEM-AD-Simplification OMA-ARC-2005-0305-assessment-of-OMA-enabler-policy-needs Note: editor did some editorial updates.

Document Identifier	Date	Sections	Description
	25 oct 2005	n/a	See Latest AD template applied Various editorial updates OMA-ARC-2005-0318R03-IETF-PEP-PDP-model-support Did not add the appendix as issues were uncovered with the reproduction of RFC texts. The proposed appendix is uploaded as OMA-ARC-2005-0366-Appendix-IETF-PEP-PDP-model Editorial updates Replaced references to PEM-3 and PEM-4 in newly inserted figures to IO+P
	18 nov 2005	n/a	See Few editorials OMA-ARC-2005-0375-PEEM-AD-usage-patterns OMA-ARC-2005-0371R03-PEEM-AD-security-section OMA-ARC-2005-0367-policy-language-candidate Updated [COMMONPOL], now point to version 6 of the IETF Internet Draft OMA-ARC-2005-0366R01-Appendix-IETF-PEP-PDP-model OMA-ARC-2005-0365-New-policy-expression-language OMA-ARC-2005-0362-Scope-and-Intro-for-PEEM-AD
	29 nov 2005	n/a	See Resolved editor's notes per e-mail discussion Modified figure 4 & 5 per e-mail discussion and notes of conference call on Nov. 29. Few editorials OMA-ARC-2005-0384R01-PEEM-AD-flow-section-input OMA-ARC-2005-0386R02-PEEM_security_addition OMA-ARC-2005-0385R01-An-OMA-engineered-policy-expression-language-candidate OMA-ARC-2005-0397-PEEM-AD-text-for-Planned-Phases-and-Architectural-Model
	08 Jan 2006	See Description	Implement agreements and AIs from Athens FTF: OMA-ARC-2005-0424-MINUTES_12Dec2005-Athens OMA-ARC-2005-0407R01-PEEM-PEM-1-candidate OMA-ARC-2005-0411-Adding_FTP_PEM_2 OMA-ARC-2005-0412-Adding_Candidate_PEM_1 OMA-ARC-2005-0419R01-A-candidate-specification-source-technology-for-PEM-1 OMA-ARC-2005-0434R02-PDP-and-PEP-roles-in-one-enabler-implementation OMA-ARC-2005-0402R02-definition-relative-issues-in-policy OMA-ARC-2005-0433R01-Comments-by-Pozefsky-on-PEEM-AD
	21 Jan 2006	Figures 14 to 17	Extend agreement of OMA-ARC-2005-0433R01-Comments-by-Pozefsky-on-PEEM-AD to Figures 14 to 17.
	20 Feb 2006	See Description	Implement agreements and AIs in OMA-ARC-2006-0045-MINUTES_06Feb2006-Paris: OMA-ARC-2006-0016R05-Alternative-PEEM-definitions Update of figures 3 to 6 consistent with OMA-ARC-2006-0015R03-PEEM_AD_Presentation_TP
	07 Mar 2006	See Description	Implement OMA-ARC-2006-0076R02-CR_PEEM_AD_Implement_new_defs
	12 Mar 2006	Remaining Editor's notes	Remove of the remaining editor's notes per email approval by the WG. Proposed for formal AD review
	03 Jun 2006	See description	Apply disposition of comments as described in OMA-ARC-2006-0113R02-OMA-AD-Policy-Evaluation-Enforcement-Management-V1_0-20060312-D--Review-Report

Document Identifier	Date	Sections	Description
	25 Jun 2006	See description	Incorporates: OMA-ARC-2006-0158R01-PEEM-AD-clarification OMA-ARC-2006-0202R01-PEEM-ADRR-Interface-to-other-resources-issue ADDR resolutions captured in OMA-ARC-2006-0193-MINUTES_12Jun2006-Osaka
	20 June 2008	See Description	Incorporates: OMA-CONRR-PEEM-V1_0-20080527-D (section 3.2)
Candidate Versions: OMA-ARC-AD_Policy_Evaluation_Enforcement_Management	05 Aug 2008	n/a	TP R&A ref# OMA-TP-2008-0284-INP_PEEM_V1_0_ERP_for_Candidate_Approval

## Appendix B. Related technologies for policy expression languages (Informative)

The following languages may be able to satisfy most of the conditions identified in Section 5.6 (alphabetically sorted):

- 3GPP TS-29.198-13 – “3rd Generation Partnership Project; Technical Specification Group Core Network and Terminals; Open Service Access (OSA); Application Programming Interface (API);Part 13: Policy management Service Capability Feature (SCF)” [[3GPP TS-29.198-13](#)]
- BPEL – Business Process Expression Language [[BPEL](#)]
- BPML - Business Process Modeling Language [[BPML](#)]
- Common Policy – a document format for expressing privacy preferences [**Error! Reference source not found.**]
- ISO/IEC 9899, “Programming languages – C” [[ISO/IEC 9899](#)], Java [**Error! Reference source not found.**]
- XACML - eXtensible Access Control Markup Language [[XACML](#)]

## Appendix C. Policy Expression Languages and other relevant specifications to be considered when selecting a PEEM policy expression language (Informative)

Various standards bodies have specified resource policies (e.g. enabler policies). The following specifications are examples of specifications that contain ways of expressing policies to describe resource specific policy data:

PoC: OMA TS-PoC\_XDM-V1\_0 specifies the PoC user access policy expression language [[PoC\\_XDM-V1\\_0 TS](#)]

Location: 3GPP TS 22.071 specifies a location policy expression language [[3GPP TS 22.071](#)]

Charging: 3GPP TS 23.125 specifies a charging policy expression language [[3GPP TS 23.125](#)]

Presence: The IETF SIMPLE working group has drafted a presence authorization policy expression language [[simple-presence-rules](#)]

Privacy: The IETF GEOPRIV working group has drafted a privacy preference policy expression language [**Error! Reference source not found.**]

These examples of policy expression languages need to be considered when selecting a policy expression language for the PEEM specification.

The PEEM specification should take into account that a service provider may have defined and deployed policies (e.g. according the examples mentioned above), when defining a policy expression language. Any such PEEM policy expression language needs to support the functions (i.e. semantics) of the existing domain-specific policy languages which would facilitate the use of PEEM while minimizing the efforts needed to support the existing policies. When supporting such policies, there is no requirement that mandates the reformatting of existing policies, neither is there a requirement that prevents reformatting.

## Appendix D. Source material for consideration for PEM-2 interface specification (Informative)

Based on the PEEM RD relevant requirements, we need to assess whether these candidates:

- meets the PEM-2 requirements. If not all requirements are met, additional specification development may be needed
- is needed in its entirety, or a subset would satisfy the PEM-2 requirements

### D.1 PEM-2 candidate XDM/XCAP

XDM includes 2 specifications, XDM Core [[XDM Core 1.0 TS](#)] and XDM Shared [[XDM Shared 1.0 TS](#)].

XCAP stands for XML Configuration Access Protocol) [[SIMPLE XCAP](#)].

Based on a summary analysis, XDM (or XCAP) seems to meet at least some of the requirements for the PEM-2 interface. The main issue may be how to use or how to extend XDM (or XCAP) in order to meet other requirements.

XCAP supports:

- XML payload (supports any schema)
- HTTP transport
- Uses XPATH-style URLs to target content using PUT, GET and DELETE

### D.2 PEM-2 candidate FTP

The use of FTP as protocol [RFC0959][FTPfcfs] exposed by PEM-2 can be considered to support uploading, downloading, deleting and renaming policies. Edit of policies is achieved by downloading, editing and uploading policies.

### D.3 PEM-2 candidate SIP Event Notification

There is also a SIP Event Notification (“sip-profile” event package allows SUBSCRIBE-NOTIFY model on XDM documents). This may be useful to meet some of the requirements, but this and any other aspects should be analyzed in detail during the specification development cycle.

## Appendix E. Informative details (Informative)

### E.1 PEEM decomposition choices

There are multiple alternative choices for PEEM further decomposition possible for PEEM implementations. All figures and text in this appendix are informative-only.

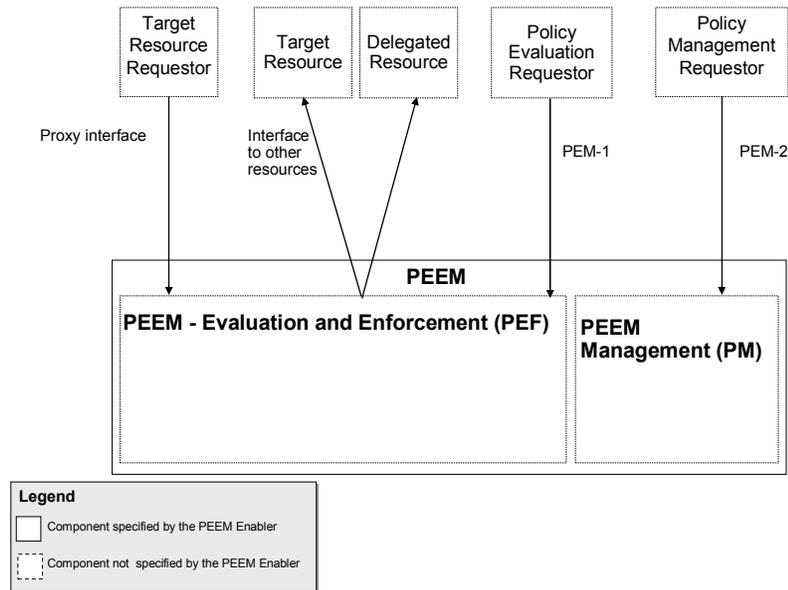
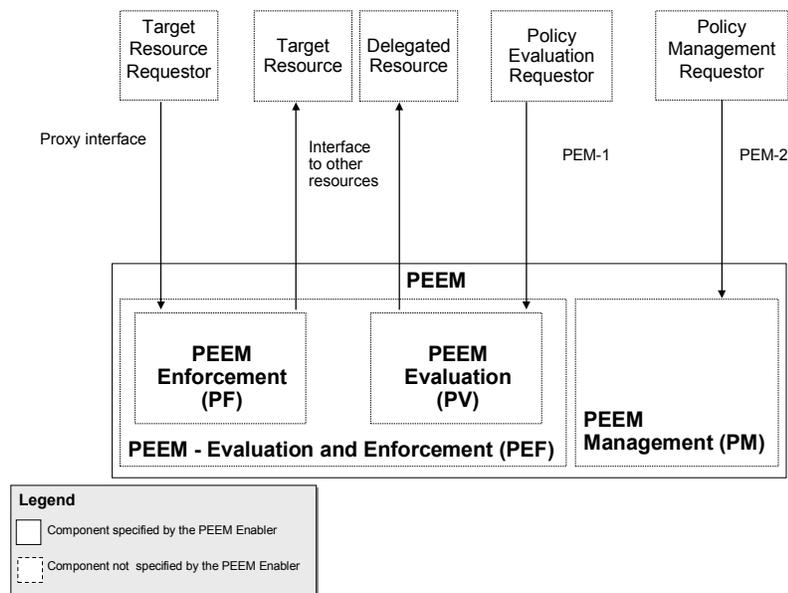


Figure 15. PEEM Enabler architecture

Figure 15 illustrates two logical components, the PEEM Evaluation and Enforcement (PEF) and the PEEM Management (PM) and all interfaces exposed/supported by PEEM.

In Figure 16, PEF is illustrated as decomposed in two distinguishable logical components, PEEM Evaluation (PV) and PEEM Enforcement (PF).



**Figure 16. PEEM Evaluation and Enforcement (PEF) illustrated as two logical components, PEEM Evaluation (PV) and PEEM Enforcement (PF)**

Thus, the PEEM enabler can be used in callable mode for PV only, to accommodate the requirements for policy evaluation only.

Figure 17 illustrates the case where the PEEM enabler performs evaluation only [PEEM-RD]. Typically this applies to a PEEM enabler in callable mode.

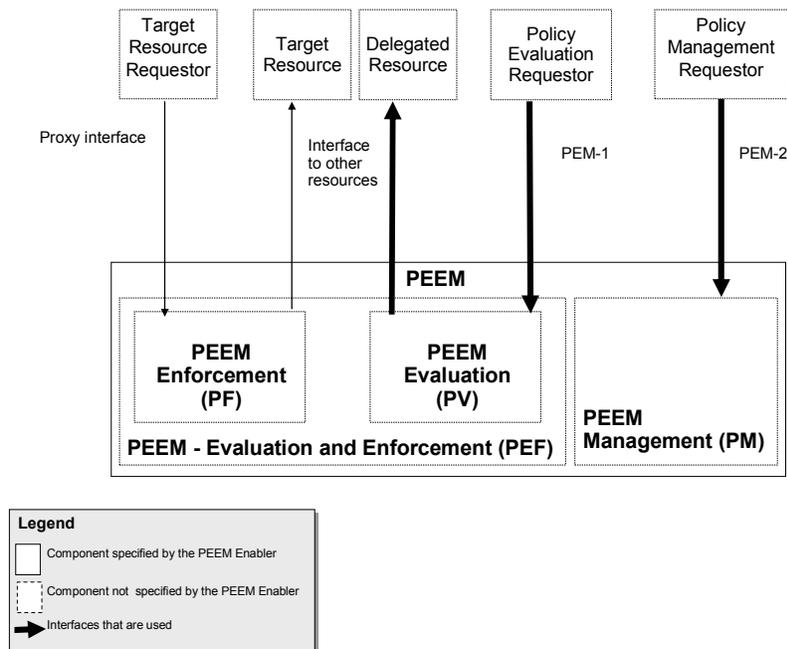


Figure 17. PEEM Enabler – relevant interfaces and components, when the PEEM Enabler performs Evaluation only

The components and interfaces not used in this specific case are shadowed.

NOTE: the PEM-1 interface is used only for evaluation requests, in this case.

## E.2 Functional components and interfaces

This section describes the functional components and interfaces identified in Figure 15, Figure 16, and Figure 17. The components and interfaces specified by PEEM are loosely coupled, in the sense that the specification for each of them does not have to be tightly coupled with the specification of the others (e.g. PEF and PM are completely decoupled, PEM-1 and PEM-2 are completely decoupled, PEF and PEM-1 are only coupled by the content of the incoming request, PEM-2 and PM are only coupled by the content of the incoming request, PEF and PEM-2 are completely decoupled and PM and PEM-1 are completely decoupled).

The following is a list of PEEM components (identified because they interact with an interface specified by PEEM):

- PEF (Policy Evaluation and Enforcement component). In the particular case depicted by Figure 15 and Figure 16 PEF is illustrated decomposed in two components:
  - PV (PEEM Evaluation). In the case of evaluation only (see Figure 17), PV is the only component involved.
  - PF (PEEM Enforcement).
- PM (Policy Management component)
- Other entities:
  - PEF Requestor
    - PEF Requestor represents a resource that issues a direct request for policy evaluation only (PV only) or evaluation and enforcement to the PEEM PEF component [PEEM-RD].
  - PM Requestor

- PM Requestor represents resource that issues a direct request for policy management to the PEEM PEF component [[PEEM-RD](#)].
- Other Resources
  - Other Resources represents other resources external to OMA – the subset of such resources as described in the OSE architecture document with which PEEM may need to communicate [[OSE-TS](#)].

## E.2.1 PEF (Policy Evaluation and Enforcement component)

The PEF (Policy Evaluation and Enforcement) component has the following features:

- identifies the policies associated with the request. Policies contain policy rules (see definitions for Policy and Policy Rule)
- processes the policy, i.e. goes through the following steps:
  - evaluates policies using messages received and other context information (see definition for Policy Evaluation, Policy Rule and Policy Condition). The component may delegate to other resources where appropriate
  - execute the policy actions resulting from a positive evaluation of the policy conditions. The component may use delegation to other resources where appropriate, and
  - may return, after completing all previous processing, a policy decision to a requestor or may allow a request to continue to its original target destination. A request for policy processing can arrive to PEEM either as a direct request for support from another entity (see also the section describing PEEM specified callable interface) or as a request from another entity to another resource, proxied (or intercepted) by PEEM (see also the section describing PEEM proxy usage pattern). In the first case, the policy processing may complete by returning a policy decision to the requesting resource (See also 5.7.1 and 5.7.4) or perform enforcement itself (see also 5.7.5). When a policy decision is returned to a resource, that resource is in control of deciding how to handle the rendered decision. In the second case, the policy processing completes by forwarding the original request to the destination resource (if the processing resulted into a “pass” condition) or by returning an error to the originating entity (if the processing resulted into a “fail” condition)

## E.2.2 PEF (Policy Evaluation and Enforcement component) with decomposition

The following paragraphs describe the particular case when PEF is decomposed in PEEM Evaluation (PV) and PEEM Enforcement (PF).

### PV (PEEM Evaluation component)

The PV (PEEM Evaluation) component is responsible for the policy evaluation portion of the PEEM requirements. This component has the following features:

- identifies the policies associated with the request.,
- evaluates these policies using context information provided by the PEF requestor
- The PV component may use delegation to other resources where appropriate.
- returns, after completing all previous processing, the result of the evaluation to the PEF requestor.

### PF (PEEM Enforcement component)

The PF (PEEM Enforcement) component is responsible for the policy enforcement portion of the PEEM requirements. This component has the following features:

- PF performs the "action" as a consequence of the result that was returned by PV (PEEM Evaluation component),

- The PF component may use delegation to other resources where appropriate.

### **E.2.3 PM (Policy Management)**

The PM (Policy Management) component provides the functions of describing, creating, updating, deleting, provisioning and viewing of policies.

## Appendix F. Assessment of OMA enabler's policy language needs (Informative)

### F.1 PoC User Access Policies

The PoC XDM specification [[PoC XDM-V1\\_0 TS](#)] specifies PoC User Access Policies.

Policies are XML Documents which are stored on a XDM server. Policies are retrieved from the XDM server using XCAP (e.g. for policy management purposes).

#### F.1.1 Properties of PoC User Access Policies

The PoC User Access Policy document SHALL conform to the structure of the policy document described in [**Error! Reference source not found.**], which means that a <ruleset> (synonym for policy) can contain zero or more <rules>. The ordering of the rules is irrelevant.

A <rule> element makes use of the following two elements:

- <conditions>
- <actions>

NOTE: Note that [**Error! Reference source not found.**] also defines <transformations> but these can (1) be regarded a type of <action> and (2) are not used in PoC User Access policies.

The policy scheme is extensible towards specific application domains: each domain can add application specific policy conditions and actions.

The conditions part is a set of expressions which evaluates to either TRUE or FALSE

Each rule is equipped with a parameter that identifies the rule.

#### F.1.2 PoC Condition elements

The <conditions> element supports the following PoC application specific XML elements

- the <identity> element.
- the <external-list> element.
- the <other-identity> element.

#### F.1.3 PoC Action elements

The <actions> element supports the PoC application specific <allow-invite> element, which defines the action the PoC Server is to take when processing a PoC session invitation for a particular user.

### F.2 PAG Authorization Policies

The presence XDM specification [[Presence SIMPLE-V1\\_0 TS](#)] specifies Presence Authorization Policies.

Policies are XML Documents which are stored on a XDM server. Policies are retrieved from the XDM server using XCAP (e.g. for policy management purposes).

#### F.2.1 Properties of Presence Authorization policies

All policies follow [[simple-presence-rules](#)], which means that an authorization policy is in three parts:

- Conditions ('When to apply the rule')
- Actions ('What to do when the condition applies')
- Transformation ('How the data needs to be modified if this is true'), where the transformation element could be another type of "Action".

## F.2.2 Types of Presence Authorization policies

There are two types of authorization policies specified:

- Subscription authorization policies which of which are specified the “action” and “condition” parts of the Subscription Authorization policy
- Presence content policies of which are specified the “transformation” part of the policy.

## F.3 Common Denominator of the OMA enabler’s policy needs

The common denominators between PoC and PAG policies are:

- use XML to describe the policy
- distinguish a <rule> that contains a <condition> and an <action>
- use XDM and XCAP to perform management of the policies.
- The policy scheme that the policies are based on allows for extensibility for defining application specific <condition> elements and <action> elements.

## Appendix G. IETF PEP-PDP model (Informative)

The informative section contains portions that were copied from the following IETF RFC.

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The following sections provide an introduction to the IETF policy architecture described in [RFC2753](#), titled "A framework for policy-based admission control".

### G.1 Introduction to IETF terminology

This section introduces the IETF terminology described in [RFC3198](#), titled "Terminology for policy-based management" and how the PEEM terminology is related to that.

**Table 2. IETF to PEEM terminology mapping**

IETF definitions <a href="#">RFC3198</a>	Corresponding OMA definitions [PEEM AD]
<p>Policy</p> <p>"Policy" can be defined from two perspectives:</p> <p>A definite goal, course or method of action to guide and determine present and future decisions. "Policies" are implemented or executed within a particular context (such as policies defined within a business unit).</p> <p>Policies as a set of rules to administer, manage, and control access to network resources <a href="#">RFC3060</a>.</p>	<p>Policy</p> <p>An ordered combination of policy rules that defines how to administer, manage, and control access to resources, [Derived from <a href="#">RFC 3060</a>, <a href="#">RFC 3198</a> and <a href="#">RFC 3460</a>].</p>
<p>Policy rule</p> <p>A basic building block of a policy-based system. It is the binding of a set of actions to a set of conditions - where the conditions are evaluated to determine whether the actions are performed <a href="#">RFC3060</a>.</p>	<p>Policy rule</p> <p>A combination of a condition and an action to be performed if the condition is true</p>
<p>Policy condition</p> <p>A representation of the necessary state and/or prerequisites that define whether a policy rule's actions should be performed. This representation need not be completely specified, but may be implicitly provided in an implementation or protocol. When the policy condition(s) associated with a policy rule evaluate to TRUE, then (subject to other considerations such as rule priorities and decision strategies) the rule should be enforced.</p> <p>In <a href="#">RFC3060</a>, a rule's conditions can be expressed as either an ORed set of ANDed sets of statements (disjunctive normal form), or an ANDed set of ORed</p>	<p>Policy condition</p> <p>A condition is a Boolean predicate that yields true or false. It may be "complex".</p>

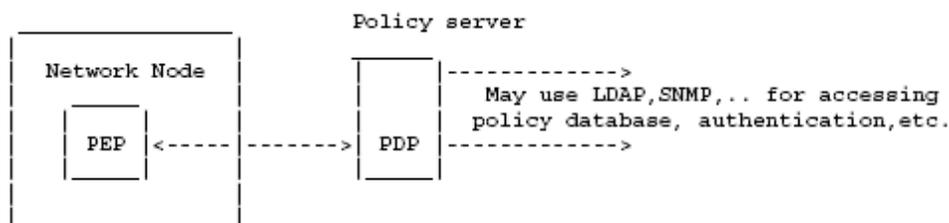
sets of statements (conjunctive normal form). Individual condition statements can also be negated.	
Policy action  Definition of what is to be done to enforce a policy rule, when the conditions of the rule are met. Policy actions may result in the execution of one or more operations to affect and/or configure network traffic and network resources. In <a href="#">RFC3060</a> , a rule's actions may be ordered.	Policy action  Action (e.g. invocation of a function, script, code, workflow) that is associated to a policy condition in a policy rule and that is executed when its associated policy condition results in "true" from the policy evaluation step.
Policy decision  Two perspectives of "policy decision" exist: <ul style="list-style-type: none"> <li>• A "process" perspective that deals with the evaluation of a policy rule's conditions</li> <li>• A "result" perspective that deals with the actions for enforcement, when the conditions of a policy rule are TRUE</li> </ul>	Policy evaluation  The process of evaluating the policy conditions and executing the associated policy actions up to the point that the end of the policy is reached.
Policy enforcement  The execution of a policy decision.	Policy enforcement  The process of executing actions, which may be performed as a consequence of the output of the policy evaluation process or during the policy evaluation process.

## G.2 Introduction to IETF Policy Architecture

The IETF policy architecture is described in [RFC2753](#), titled "Framework for policy-based admission control". Note that [RFC2753](#) elaborates quite extensively on the policy architecture. The following introductory text is copied from [RFC2753](#) and some crucial parts have been underlined:

The two main architectural elements for policy control are the PEP (Policy Enforcement Point) and the PDP (Policy Decision Point). Figure 1 shows a simple configuration involving these two elements; PEP is a component at a network node and PDP is a remote entity that may reside at a policy server. The PEP represents the component that always runs on the policy aware node. It is the point at which policy decisions are actually enforced.

Policy decisions are made primarily at the PDP. The PDP itself may make use of additional mechanisms and protocols to achieve additional functionality such as user authentication, accounting, policy information storage, etc. For example, the PDP is likely to use an LDAP-based directory service for storage and retrieval of policy information.



**Figure 18. A simple configuration with the primary policy control architecture components. PDP may use additional mechanisms and protocols for the purpose of accounting, authentication, policy storage, etc.**

The basic interaction between the components begins with the PEP. The PEP will receive a notification or a message that requires a policy decision. Given such an event, the PEP then formulates a request for a policy decision and sends it to the PDP. The PDP returns the policy decision and the PEP then enforces

the policy decision by appropriately accepting or denying the request. The PDP may also return additional information to the PEP. This information need not be associated with an admission control decision. Rather, it can be used to formulate an error message or outgoing/forwarded message (e.g. ask user consent).

It must be noted that the PDP acts as the final authority for the decision returned to the PEP and the PEP must enforce the decision rendered by the PDP.

In the case of an external PDP, the need for a communication protocol between the PEP and PDP arises. In order to allow for interoperability between different vendors networking elements and (external) policy servers, this protocol should be standardized.

## Appendix H. Source material for consideration for PEM-1 interface specification (Informative)

### H.1 PEM-1 candidate SAML profile of XACML

Based on the PEEM RD relevant requirements, a relevant specification is the SAML 2.0 profile of XACML v2.0 specification [Error! Reference source not found.] – as a potential basis for specifying the PEM-1 interface:

- Chapter 3 of [Error! Reference source not found.] defines a policy decision query request and policy decision response schema.
- The [Error! Reference source not found.] policy decision query request allows the Evaluation requestor to submit an XACML request context [XACML, chapter 3.2 and 6] in a SAML request [Error! Reference source not found., Chapter 3] to the callable PEEM enabler.
- The request context in the policy decision query request of [Error! Reference source not found.] allows for transport of input data for the policy evaluation and/or enforcement process.
- The [Error! Reference source not found.] policy decision response allows the PEEM enabler to return an XACML decision response context [XACML, chapter 3.2 and 6] in a SAML response [Error! Reference source not found., Chapter 3] to the Evaluation requestor. The Evaluation Requestor enforces that decision.
- The response context in the policy decision response of [Error! Reference source not found.] allows for transport of a decision as the result of a policy evaluation and/or enforcement process.
- The [Error! Reference source not found.] supports XML payload.
- The [Error! Reference source not found.] policy decision query request and decision response scheme is extensible.
- The [Error! Reference source not found.] is extensible to support input and output BLOB parameters.
- The [Error! Reference source not found.] is optimized for authorization policy decision requests and policy decision responses and can be generalized for generic policy decision requests and policy decision responses.

### H.2 PEM-1 candidate BLOB

PEM-1 can have two input parameters and one output parameter:

- A BLOB input parameter that can carry any binary data. An example of BLOB interface can be found at [Error! Reference source not found.].
- An optional input parameter specifying the policy to enforce.
- A BLOB output parameter that can carry any binary data, its contents and format defined by the policy rules. To respect its contract with authorized requestors, policies should return the expected data types

Note that the same interface is used for both evaluation or evaluation and execution.

### H.3 PEM-1 candidate Parlay Policy Management

[Error! Reference source not found.] is a 3GPP joint Parlay/OSA specification that includes definition of policy expression language aspects, as well as definition for interfaces and API. This specification is therefore considered a valid candidate to be taken into consideration when proposing a technical specification for the PEM-1 (PEEM callable) interface, as it provides an API for Policy Evaluation and a technology to match input context to a policy.

