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IPsec Configuration Policy Information Model

Status of this Memo

This document specifies an Internet standards track protocol for the Internet community, and requests discussion and suggestions for improvements. Please refer to the current edition of the "Internet Official Protocol Standards" (STD 1) for the standardization state and status of this protocol. Distribution of this memo is unlimited.

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Abstract

This document presents an object-oriented information model of IP Security (IPsec) policy designed to facilitate agreement about the content and semantics of IPsec policy, and enable derivations of task-specific representations of IPsec policy such as storage schema, distribution representations, and policy specification languages used to configure IPsec-enabled endpoints. The information model described in this document models the configuration parameters defined by IPSec. The information model also covers the parameters found by the Internet Key Exchange protocol (IKE). Other key exchange protocols could easily be added to the information model by a simple extension. Further extensions can further be added easily due to the object-oriented nature of the model.

This information model is based upon the core policy classes as defined in the Policy Core Information Model (PCIM) and in the Policy Core Information Model Extensions (PCIMe).

Table of Contents

1. Introduction

IP security (IPsec) policy may assume a variety of forms as it travels from storage, to distribution, to decision points. At each step, it needs to be represented in a way that is convenient for the current task. For example, the policy could exist as, but is not limited to:

- A Lightweight Directory Access Protocol (LDAP) [LDAP] schema in a directory.

- An on-the-wire representation over a transport protocol like the Common Object Policy Service (COPS) [COPS, COPSPR].

- A text-based policy specification language suitable for editing by an administrator.

- An Extensible Markup Language (XML) document.

Each of these task-specific representations should be derived from a canonical representation that precisely specifies the content and semantics of the IPsec policy. This document captures this concept and introduces a task-independent canonical representation for IPsec policies.

This document focuses mainly on the existing protocols [COMP, ESP, AH, DOI, IKE]. The model can easily be extended if needed due to its object-oriented nature.

This document is organized as follows:

- Section 2 provides a quick introduction to the Unified Modeling Language (UML) graphical notation conventions used in this document.

- Section 3 provides the inheritance hierarchy that describes where the IPsec policy classes fit into the policy class hierarchy already defined by the Policy Core Information Model (PCIM) and Policy Core Information Model Extensions (PCIMe).

- Sections 4 through 8 describe the classes that make up the IPsec policy model.

- Section 9 presents the implementation requirements for the classes in the model (i.e., the MUST/MAY/SHOULD status).

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 [KEYWORDS].

2. UML Conventions

For this document, a UML static class diagram was chosen as the canonical representation for the IPsec policy model, because UML provides a graphical, task-independent way to model systems. A treatise on the graphical notation used in UML is beyond the scope of this paper. However, given the use of ASCII drawing for UML static class diagrams, a description of the notational conventions used in this document is in order:

- Boxes represent classes, with class names in brackets ([]) representing an abstract class.

- A line that terminates with an arrow (<, >, ^, v) denotes inheritance. The arrow always points to the parent class. Inheritance can also be called generalization or specialization (depending upon the reference point). A base class is a generalization of a derived class, and a derived class is a specialization of a base class.

- Associations are used to model a relationship between two classes. Classes that share an association are connected using a line. A special kind of association is also used: an aggregation. An aggregation models a whole-part relationship between two classes. Associations, and therefore aggregations, are also modeled as classes.

- A line that begins with an "o" denotes aggregation. Aggregation denotes containment in which the contained class and the containing class have independent lifetimes.

- At each end of a line representing an association appears a cardinality (i.e., each association has 2 cardinalities). Cardinalities indicate the constraints on the number of object instances in a set of relationships. The cardinality on a given end of an association indicates the number of different object instances of that class that may be associated with a single object instance of the class on the other end of the association. The cardinality may be:

  - a range in the form "lower bound..upper bound" indicating the minimum and maximum number of objects.

  - a number that indicates the exact number of objects.

  - an asterisk indicating any number of objects, including zero. An asterisk is shorthand for 0..n.

  - the letter n indicating from 1 to many. The letter n is shorthand for 1..n.

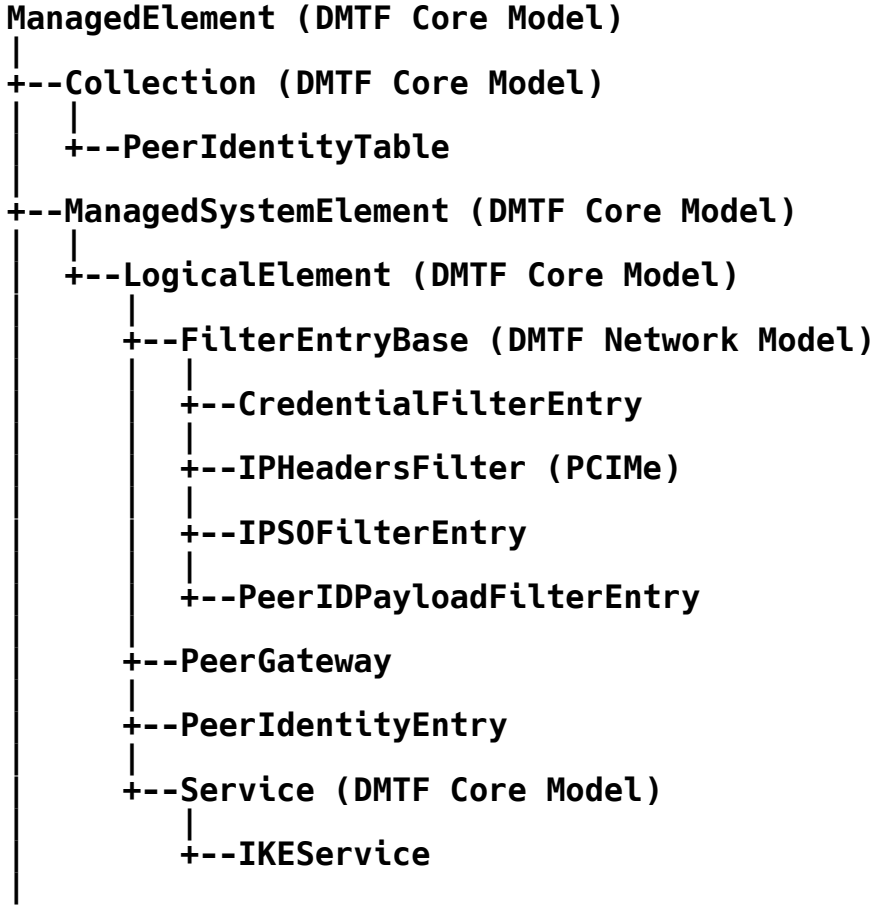
- A class that has an association may have a "w" next to the line representing the association. This is called a weak association and is discussed in [PCIM].

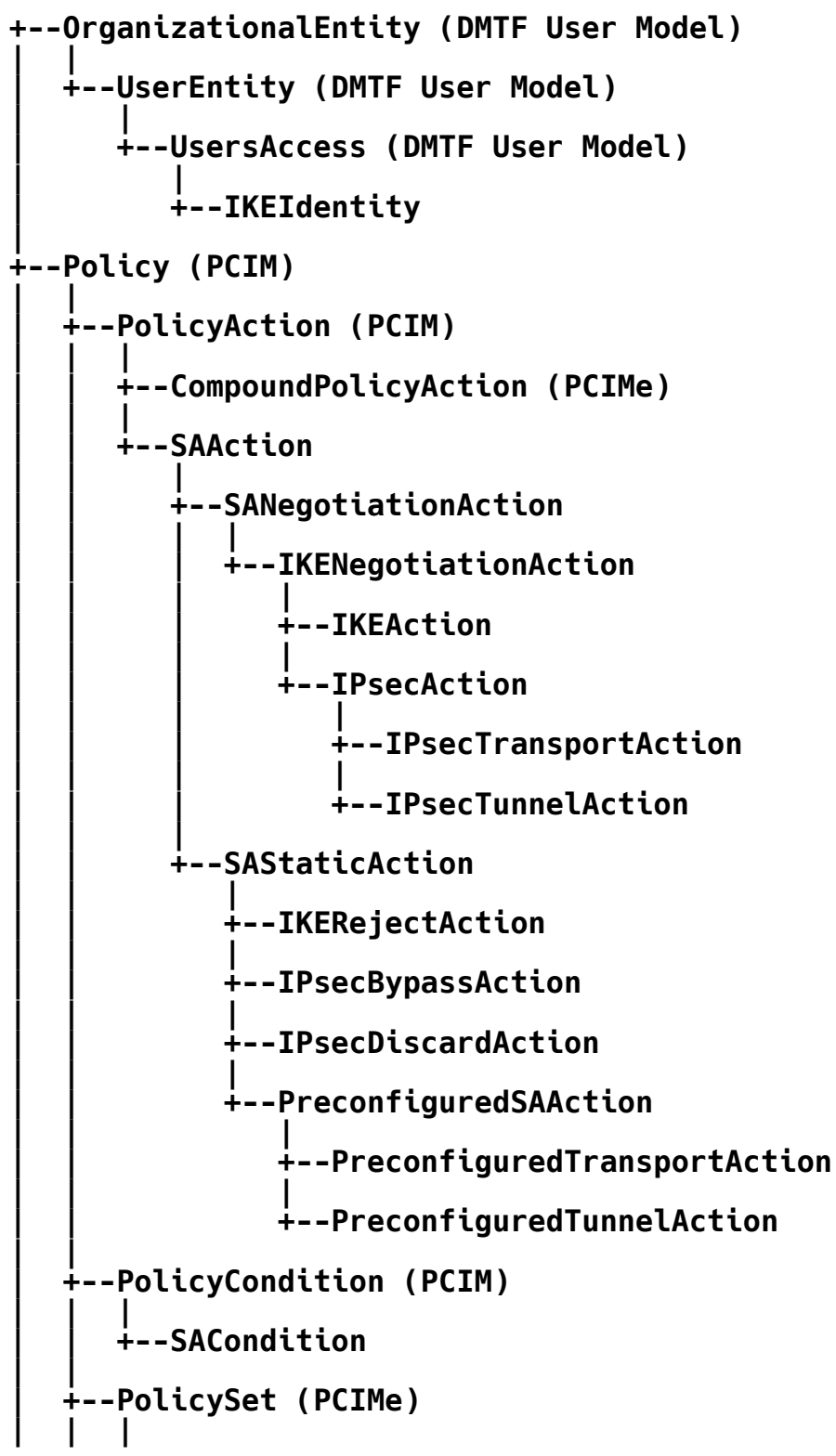
It should be noted that the UML static class diagram presented is a conceptual view of IPsec policy designed to aid in understanding. It does not necessarily get translated class for class into another

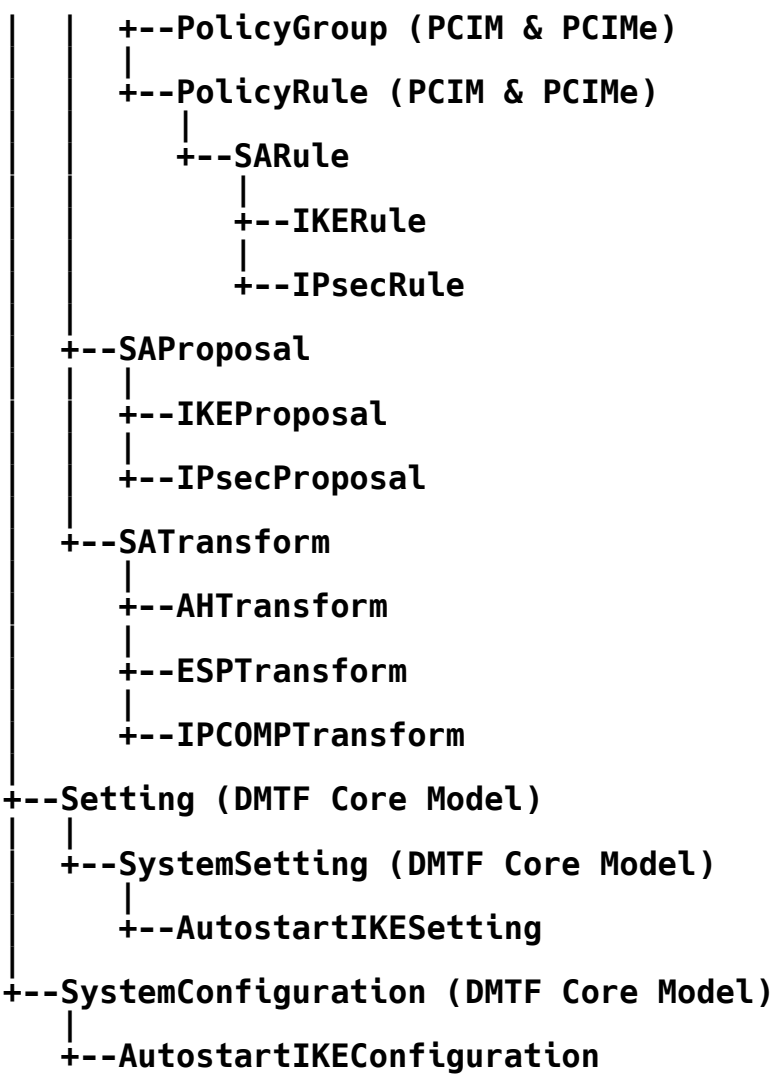
representation. For example, an LDAP implementation may flatten out the representation to fewer classes (because of the inefficiency of following references).

3. IPsec Policy Model Inheritance Hierarchy

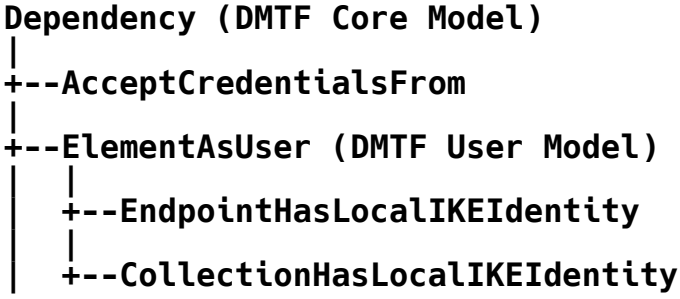
Like PCIM and PCIMe, the IPsec Configuration Policy Model derives from and uses classes defined in the DMTF [DMTF] Common Information Model (CIM). The following tree represents the inheritance hierarchy for the IPsec Policy Model classes and how they fit into PCIM, PCIMe and the other DMTF models (see Appendices for descriptions of classes that are not being introduced as part of IPsec model). CIM classes that are not used as a superclass to derive new classes, but are used only as references, are not included in this inheritance hierarchy, but can be found in the appropriate DMTF document: Core Model [CIMCORE], User Model [CIMUSER] or, Network Model [CIMNETWORK].

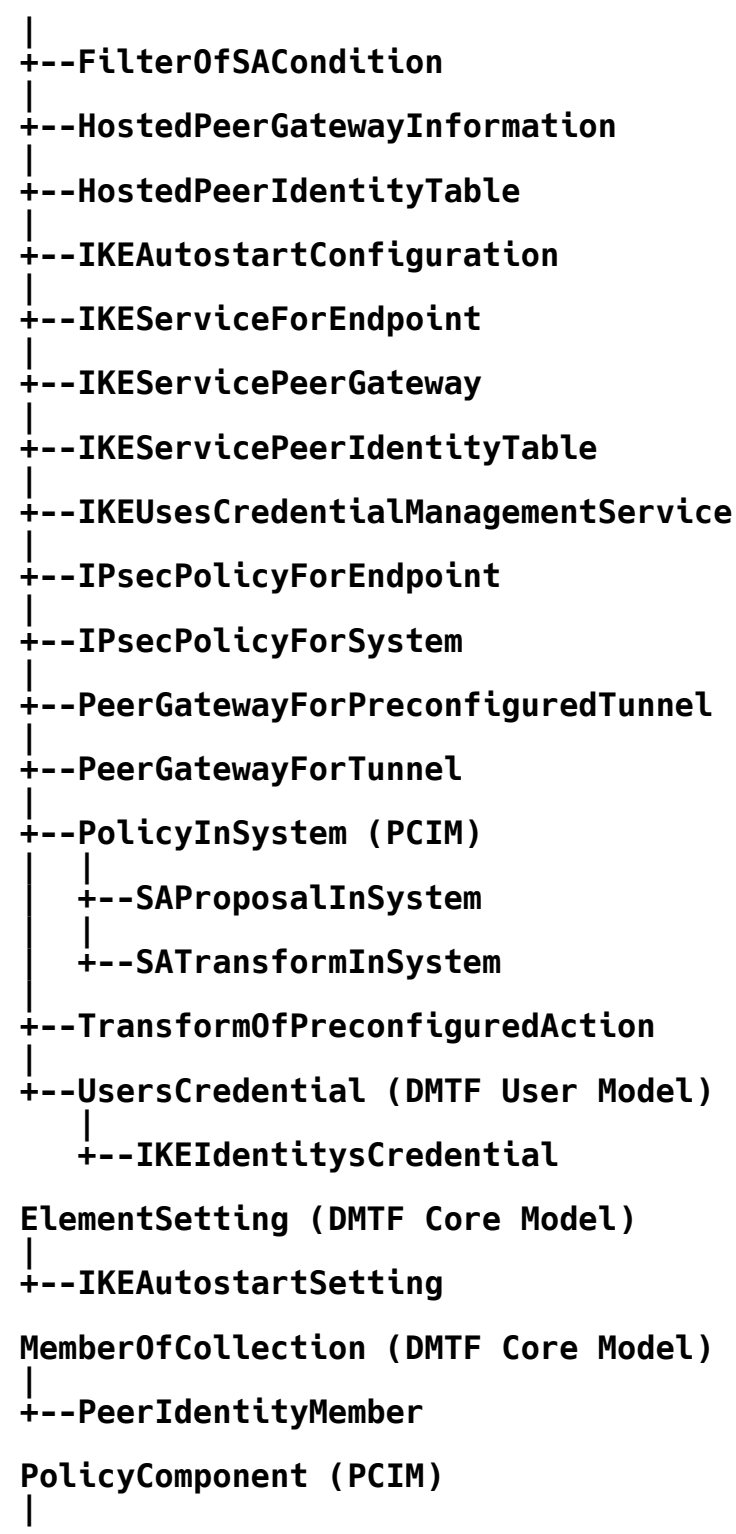


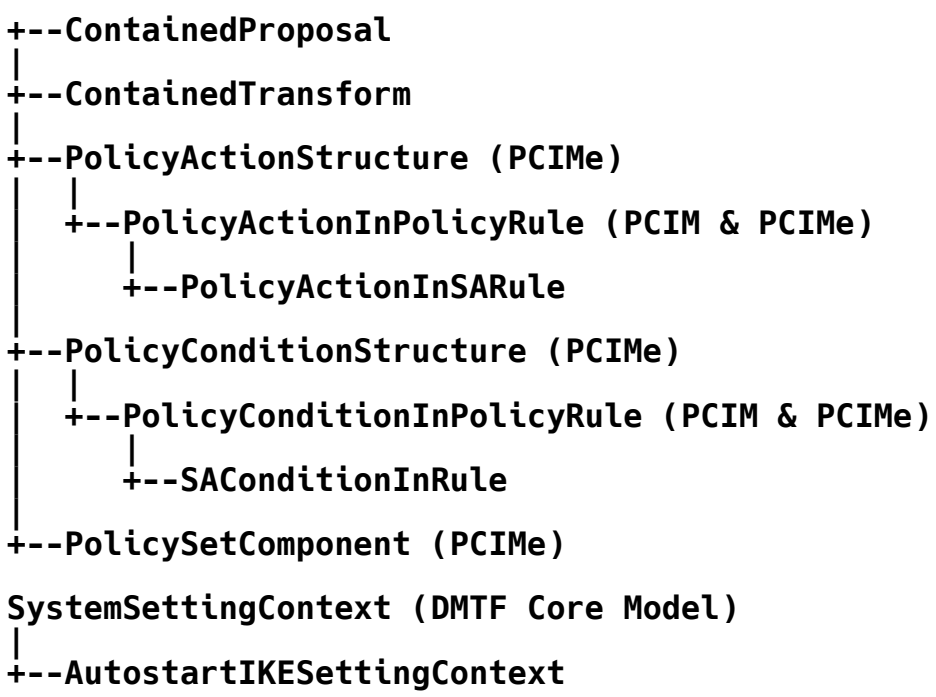

+--OrganizationalEntity (DMTF User Model)
+--UserEntity (DMTF User Model)
+--UsersAccess (DMTF User Model)
+--IKEIdentity
+--Policy (PCIM)
+--PolicyAction (PCIM)
+--CompoundPolicyAction (PCIMe)
+--SAAction
+--SANegotiationAction
+--IKENegotiationAction
+--IKEAction
+--IPsecAction
+--IPsecTransportAction
+--IPsecTunnelAction
+--SAStaticAction
+--IKERejectAction
+--IPsecBypassAction
+--IPsecDiscardAction
+--PreconfiguredSAAction
+--PreconfiguredTransportAction
+--PreconfiguredTunnelAction
+--PolicyCondition (PCIM)
+--SACondition
+--PolicySet (PCIMe)



The following tree represents the inheritance hierarchy of the IPsec policy model association classes and how they fit into PCIM and the other DMTF models (see Appendices for description of association classes that are not being introduced as part of IPsec model).

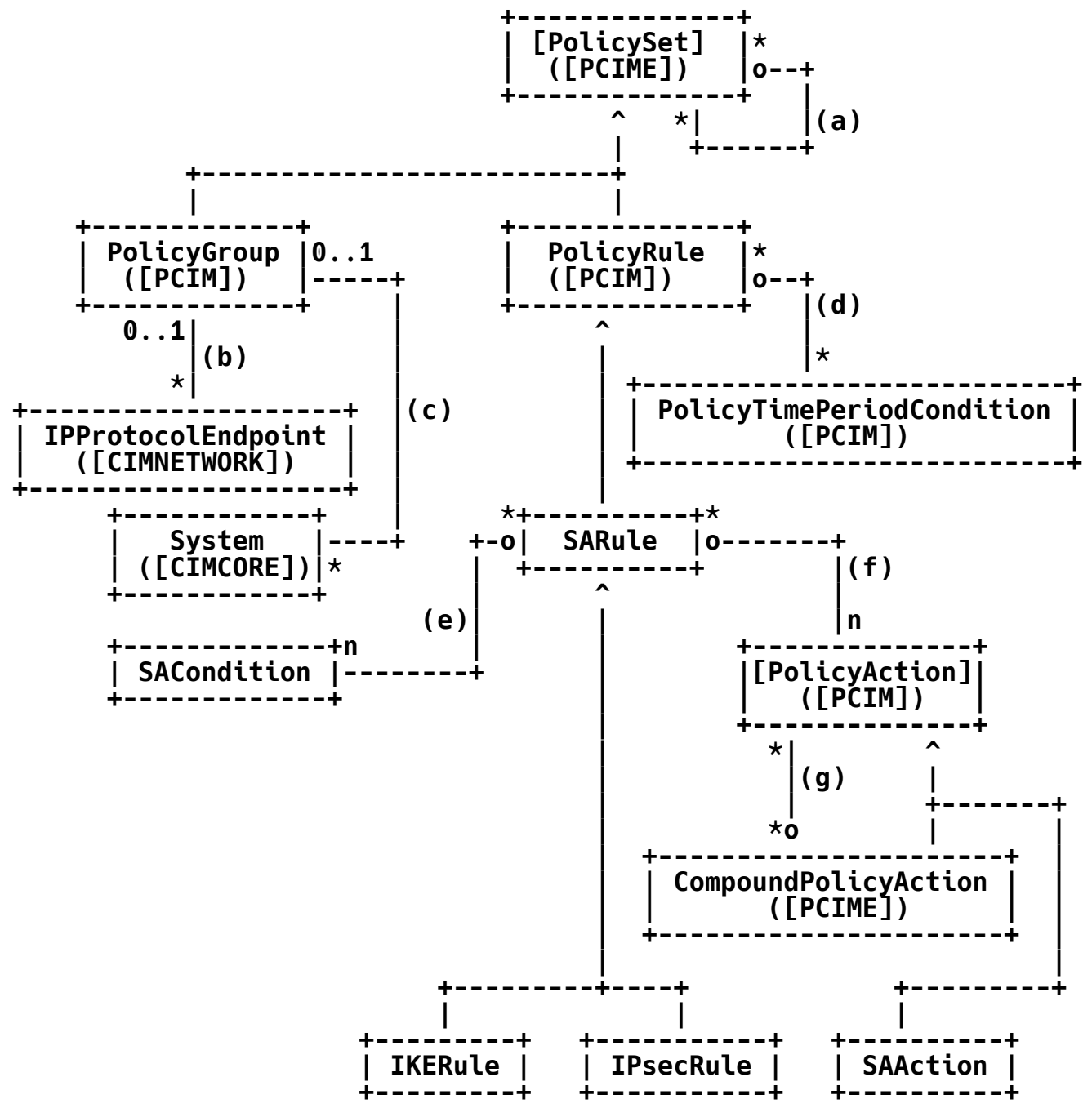



|
+--FilterOfSACondition
|
+--HostedPeerGatewayInformation
|
+--HostedPeerIdentityTable
|
+--IKEAutostartConfiguration
|
+--IKEServiceForEndpoint
|
+--IKEServicePeerGateway
|
+--IKEServicePeerIdentityTable
|
+--IKEUsesCredentialManagementService
|
+--IPsecPolicyForEndpoint
|
+--IPsecPolicyForSystem
|
+--PeerGatewayForPreconfiguredTunnel
|
+--PeerGatewayForTunnel
|
+--PolicyInSystem (PCIM)
| |
| +--SAProposalInSystem
| |
| +--SATransformInSystem
|
+--TransformOfPreconfiguredAction
|
+--UsersCredential (DMTF User Model)
|
+--IKEIdentitysCredential
ElementSetting (DMTF Core Model)
|
+--IKEAutostartSetting
MemberOfCollection (DMTF Core Model)
|
+--PeerIdentityMember
PolicyComponent (PCIM)
|


+--ContainedProposal
|
+--ContainedTransform
|
+--PolicyActionStructure (PCIMe)
| |
| +--PolicyActionInPolicyRule (PCIM & PCIMe)
| |
| +--PolicyActionInSARule
|
+--PolicyConditionStructure (PCIMe)
| |
| +--PolicyConditionInPolicyRule (PCIM & PCIMe)
| |
| +--SAConditionInRule
|
+--PolicySetComponent (PCIMe)
SystemSettingContext (DMTF Core Model)
|
+--AutostartIKESettingContext

4. Policy Classes

The IPsec policy classes represent the set of policies that are contained on a system.



(a) PolicySetComponent ([PCIME])
(b) IPsecPolicyForEndpoint
(c) IPsecPolicyForSystem
(d) PolicyRuleValidityPeriod ([PCIM])
(e) SAConditionInRule
(f) PolicyActionInSARule
(g) PolicyActionInPolicyAction ([PCIME])

A PolicyGroup represents the set of policies that are used on an interface. This PolicyGroup SHOULD be associated either directly with the IPProtocolEndpoint class instance that represents the interface (via the IPsecPolicyForEndpoint association) or indirectly (via the IPsecPolicyForSystem association) associated with the System that hosts the interface.

The IKE and IPsec rules are used to build or to negotiate the IPsec Security Association Database (SADB). The IPsec rules represent the Security Policy Database. The SADB itself is not modeled by this document.

The IKE and IPsec rules can be described as (also see section 6 about actions):

- An egress unprotected packet will first be checked against the IPsec rules. If a match is found, the SADB will be checked. If there is no corresponding IPsec SA in the SADB, and if IKE negotiation is required by the IPsec rule, the corresponding IKE rules will be used. The negotiated or preconfigured SA will then be installed in the SADB.

- An ingress unprotected packet will first be checked against the IPsec rules. If a match is found, the SADB will be checked for a corresponding IPsec SA. If there is no corresponding IPsec SA and a preconfigured SA exists, this preconfigured SA will be installed in the IPsec SADB. This behavior should only apply to bypass and discard actions.

- An ingress protected packet will first be checked against the IPsec rules. If a match is found, the SADB will be checked for a corresponding IPsec SA. If there is no corresponding IPsec SA and a preconfigured SA exists, this preconfigured SA will be installed in the IPsec SADB.

- An ingress IKE negotiation packet, which is not part of an existing IKE SA, will be checked against the IKE rules. The SACondition for the IKERule will usually be composed of a PeerIDPayloadFilterEntry (typically for an aggressive mode IKE

negotiation) or an IPHeadersFilter. The negotiated SA will then be installed in the SADB.

It is expected that when an IKE negotiation is required to be initiated by an IPsec rule, the set of IKE rules will be checked. The IKE rules check will be based on the outgoing IKE packet using IPHeadersFilter entries (typically using the HdrDstAddress property).

4.1. The Class SARule

The class SARule serves as a base class for IKERule and IPsecRule. Even though the class is concrete, it MUST not be instantiated. It defines a common connection point for associations to conditions and actions for both types of rules. Through its derivation from PolicyRule, an SARule (and therefore IKERule and IPsecRule) also has the PolicyRuleValidityPeriod association.

Each SARule in a valid PolicyGroup MUST have a unique associated priority number in the PolicySetComponent.Priority. The class definition for SARule is as follows:

```
NAME          SARule
DESCRIPTION   A base class for IKERule and IPsecRule.
DERIVED FROM  PolicyRule (see [PCIM] & [PCIME])
ABSTRACT      FALSE
PROPERTIES    PolicyRuleName (from PolicyRule)
              Enabled (from PolicyRule)
              ConditionListType (from PolicyRule)
              RuleUsage (from PolicyRule)
              Mandatory (from PolicyRule)
              SequencedActions (from PolicyRule)
              ExecutionStrategy (from PolicyRule)
              PolicyRoles (from PolicySet)
              PolicyDecisionStrategy (from PolicySet)
              LimitNegotiation
```

4.1.1. The Properties PolicyRuleName, Enabled, ConditionListType, RuleUsage, Mandatory, SequencedActions, PolicyRoles, and PolicyDecisionStrategy

For a description of these properties, see [PCIM] and [PCIME].

In SARule subclass instances:

- if the property Mandatory exists, it MUST be set to "true".
- if the property SequencedActions exists, it MUST be set to "mandatory".

- the property PolicyRoles is not used in the device-level model.

- if the property PolicyDecisionStrategy exists, it must be set to "FirstMatching".

4.1.2. The Property ExecutionStrategy

The ExecutionStrategy properties in the PolicyRule subclasses (and in the CompoundPolicyAction class) determine the behavior of the contained actions. It defines the strategy to be used in executing the sequenced actions aggregated by a rule or a compound action. In the case of actions within a rule, the PolicyActionInSARule aggregation is used to collect the actions into an ordered set; in the case of a compound action, the PolicyActionInPolicyAction aggregation is used to collect the actions into an ordered subset.

There are three execution strategies: do until success, do all, and do until failure.

"Do Until Success" causes the execution of actions according to the ActionOrder property in the aggregation instances until a successful execution of a single action. These actions may be evaluated to determine if they are appropriate to execute rather than blindly trying each of the actions until one succeeds. For an initiator, they are tried in the ActionOrder until the list is exhausted or one completes successfully. For example, an IKE initiator may have several IKEActions for the same SACondition. The initiator will try all IKEActions in the order defined by ActionOrder. I.e., it will possibly try several phase 1 negotiations with different modes (main mode then aggressive mode) and/or with multiple IKE peers. For a responder, when there is more than one action in the rule with "do until success" condition clause, this provides alternative actions depending on the received proposals. For example, the same IKERule may be used to handle aggressive mode and main mode negotiations with different actions. The responder uses the first appropriate action in the list of actions.

"Do All" causes the execution of all the actions in the aggregated set according to their defined order. The execution continues regardless of failures.

"Do Until Failure" causes the execution of all actions according to a predefined order until the first failure in execution of an action instance. Please note that if all actions are successful, then the aggregated result is a failure. This execution strategy is inherited from [PCIME] and is not expected to be of any use for IPsec configuration.

For example, in a nested SAs case, the actions of an initiator's rule might be structured as:

```
IPsecRule.ExecutionStrategy='Do All'
|
+---1--- IPsecTunnelAction    // set up SA from host to gateway
|
+---2--- IPsecTransportAction // set up SA from host through
                              // tunnel to remote host
```

Another example, showing a rule with fallback actions might be structured as:

```
IPsecRule.ExecutionStrategy='Do Until Success'
|
+---6--- IPsecTransportAction // negotiate SA with peer
|
+---9--- IPsecBypassAction    // but if you must, allow in the clear
```

The CompoundPolicyAction class (See [PCIME]) may be used in constructing the actions of IKE and IPsec rules when those rules specify both multiple actions and fallback actions. The ExecutionStrategy property in CompoundPolicyAction is used in conjunction with that in the PolicyRule.

For example, in nesting SAs with a fallback security gateway, the actions of a rule might be structured as:

```
IPsecRule.ExecutionStrategy='Do All'
|
+---1--- CompoundPolicyAction.ExecutionStrategy='Do Until Success'
|        |
|        +---1--- IPsecTunnelAction  // set up SA from host to
|        |                           // gateway1
|        |
|        +---2--- IPsecTunnelAction  // or set up SA to gateway2
|
+---2--- IPsecTransportAction        // then set up SA from host
                                     // through tunnel to remote
                                     // host
```

In the case of "Do All", a couple of actions can be executed successfully before a subsequent action fails. In this case, some IKE or IPsec actions may have resulted in SAs creation. Even if the net effect of the aggregated actions is failure, those created SAs MAY be kept or MAY be deleted.

In the case of "Do All", the IPsec selectors to be used during IPsec SA negotiation are:

- for the last IPsecAction of the aggregation (i.e., usually the innermost IPsec SA): this is the combination of the IPHeadersFilter class and of the Granularity property of the IPsecAction.

- for all other IPsecActions of the aggregation: the selector is the source IP address which is the local IP address, and the destination IP address is the PeerGateway IP address of the following IPsecAction of the "Do All" aggregation. NB: the granularity is IP address to IP address.

If the above behavior is not desirable, the alternative is to define several SARules, one for each IPsec SA to be built. This will allow the definition of specific IPsec selectors for all IPsecActions.

4.1.3 The Property LimitNegotiation

The property LimitNegotiation is used as part of processing either an IKE or an IPsec rule.

Before proceeding with a phase 1 negotiation, this property is checked to determine whether the negotiation role of the rule matches that defined for the negotiation being undertaken (e.g., Initiator, Responder, or Both). If this check fails (e.g., the current role is IKE responder, while the rule specifies IKE initiator), then the IKE negotiation is stopped. Note that this only applies to new IKE phase 1 negotiations and has no effect on either renegotiation or refresh operations with peers for which an established SA already exists.

Before proceeding with a phase 2 negotiation, the LimitNegotiation property of the IPsecRule is first checked to determine if the negotiation role indicated for the rule matches that of the current negotiation (Initiator, Responder, or Either). Note that this limit applies only to new phase 2 negotiations. It is ignored when an attempt is made to refresh an expiring SA (either side can initiate a refresh operation). The IKE system can determine that the negotiation is a refresh operation by checking to see if the selector information matches that of an existing SA. If LimitNegotiation does not match and the selector corresponds to a new SA, the negotiation is stopped.

The property is defined as follows:

NAME	LimitNegotiation
DESCRIPTION	Limits the role to be undertaken during negotiation.
SYNTAX	unsigned 16-bit integer
VALUE	1 - initiator-only 2 - responder-only 3 - both

4.2. The Class IKERule

The class IKERule associates Conditions and Actions for IKE phase 1 negotiations. The class definition for IKERule is as follows:

NAME	IKERule
DESCRIPTION	Associates Conditions and Actions for IKE phase 1 negotiations.
DERIVED FROM	SARule
ABSTRACT	FALSE
PROPERTIES	same as SARule, plus IdentityContexts

4.2.1. The Property IdentityContexts

The IKE service of a security endpoint may have multiple identities for use in different situations. The combination of the interface (represented by the IPProtocolEndpoint or by a collection of IPProtocolEndpoints), the identity type (as specified in the IKEAction), and the IdentityContexts specifies a unique identity.

The IdentityContexts property specifies the context to select the relevant IKE identity to be used during the further IKEAction. A context may be a VPN name or other identifier for selecting the appropriate identity for use on the protected IPProtocolEndpoint (or collection of IPProtocolEndpoints).

IdentityContexts is an array of strings. The multiple values in the array are logically ORed together in evaluating the IdentityContexts. Each value in the array may be the composition of multiple context names. So, a single value may be a single context name (e.g., "CompanyXVPN"), or it may be combination of contexts. When an array value is a composition, the individual values are logically ANDed together for evaluation purposes and the syntax is:

```
<ContextName>[&&<ContextName>]*
```

where the individual context names appear in alphabetical order (according to the collating sequence for UCS-2). So, for example,

the values "CompanyXVPN", "CompanyYVPN&&TopSecret", "CompanyZVPN&&Confidential" means that, for the appropriate IPProtocolEndpoint and IdentityType, the contexts are matched if the identity specifies "CompanyXVPN", "CompanyYVPN&&TopSecret", or "CompanyZVPN&&Confidential".

The property is defined as follows:

```
NAME         IdentityContexts
DESCRIPTION  Specifies the context in which to select the IKE
             identity.
SYNTAX       string array
```

4.3. The Class IPsecRule

The class IPsecRule associates Conditions and Actions for IKE phase 2 negotiations for the IPsec DOI. The class definition for IPsecRule is as follows:

```
NAME         IPsecRule
DESCRIPTION  Associates Conditions and Actions for IKE phase 2
             negotiations for the IPsec DOI.
DERIVED FROM SARule
ABSTRACT     FALSE
PROPERTIES   same as SARule
```

4.4. The Association Class IPsecPolicyForEndpoint

The class IPsecPolicyForEndpoint associates a PolicyGroup with a specific network interface. If an IPProtocolEndpoint of a system does not have an IPsecPolicyForEndpoint-associated PolicyGroup, then the IPsecPolicyForSystem associated PolicyGroup is used for that endpoint. The class definition for IPsecPolicyForEndpoint is as follows:

```
NAME         IPsecPolicyForEndpoint
DESCRIPTION  Associates a policy group to a network interface.
DERIVED FROM Dependency (see [CIMCORE])
ABSTRACT     FALSE
PROPERTIES   Antecedent[ref IPProtocolEndpoint[0..n]]
             Dependent[ref PolicyGroup[0..1]]
```

4.4.1. The Reference Antecedent

The property Antecedent is inherited from Dependency and is overridden to refer to an IPProtocolEndpoint instance. The [0..n] cardinality indicates that a PolicyGroup instance may be associated with zero or more IPProtocolEndpoint instances.

4.4.2. The Reference Dependent

The property Dependent is inherited from Dependency and is overridden to refer to a PolicyGroup instance. The [0..1] cardinality indicates that an IPProtocolEndpoint instance may have an association to at most one PolicyGroup instance.

4.5. The Association Class IPsecPolicyForSystem

The class IPsecPolicyForSystem associates a PolicyGroup with a specific system. If an IPProtocolEndpoint of a system does not have an IPsecPolicyForEndpoint-associated PolicyGroup, then the IPsecPolicyForSystem associated PolicyGroup is used for that endpoint. The class definition for IPsecPolicyForSystem is as follows:

```
NAME         IPsecPolicyForSystem
DESCRIPTION  Default policy group for a system.
DERIVED FROM Dependency (see [CIMCORE])
ABSTRACT     FALSE
PROPERTIES   Antecedent[ref System[0..n]]
             Dependent[ref PolicyGroup[0..1]]
```

4.5.1. The Reference Antecedent

The property Antecedent is inherited from Dependency and is overridden to refer to a System instance. The [0..n] cardinality indicates that a PolicyGroup instance may have an association to zero or more System instances.

4.5.2. The Reference Dependent

The property Dependent is inherited from Dependency and is overridden to refer to a PolicyGroup instance. The [0..1] cardinality indicates that a System instance may have an association to at most one PolicyGroup instance.

4.6. The Aggregation Class SAConditionInRule

The class SAConditionInRule associates an SARule with the SACondition instance(s) that trigger(s) it. The class definition for SAConditionInRule is as follows:

```
NAME         SAConditionInRule
DESCRIPTION  Associates an SARule with the SACondition instance(s)
             that trigger(s) it.
DERIVED FROM PolicyConditionInPolicyRule (see [PCIM] & [PCIME])
ABSTRACT     FALSE
```

```
PROPERTIES   GroupNumber (from PolicyConditionInPolicyRule)
             ConditionNegated (from PolicyConditionInPolicyRule)
             GroupComponent [ref SARule [0..n]]
             PartComponent [ref SACondition [1..n]]
```

4.6.1. The Properties GroupNumber and ConditionNegated

For a description of these properties, see [PCIM].

4.6.2. The Reference GroupComponent

The property GroupComponent is inherited from PolicyConditionInPolicyRule and is overridden to refer to an SARule instance. The [0..n] cardinality indicates that an SACondition instance may be contained in zero or more SARule instances.

4.6.3. The Reference PartComponent

The property PartComponent is inherited from PolicyConditionInPolicyRule and is overridden to refer to an SACondition instance. The [1..n] cardinality indicates that an SARule instance MUST contain at least one SACondition instance.

4.7. The Aggregation Class PolicyActionInSARule

The PolicyActionInSARule class associates an SARule with one or more PolicyAction instances. In all cases where an SARule is being used, the contained actions MUST be either subclasses of SAAction or instances of CompoundPolicyAction. For an IKERule, the contained actions MUST be related to phase 1 processing, i.e., IKEAction or IKERejectAction. Similarly, for an IPsecRule, contained actions MUST be related to phase 2 or preconfigured SA processing, e.g., IPsecTransportAction, IPsecBypassAction, etc. The class definition for PolicyActionInSARule is as follows:

```
NAME         PolicyActionInSARule
DESCRIPTION  Associates an SARule with its PolicyAction(s).
DERIVED FROM PolicyActionInPolicyRule (see [PCIM] & [PCIME])
ABSTRACT     FALSE
PROPERTIES   GroupComponent [ref SARule [0..n]]
             PartComponent [ref PolicyAction [1..n]]
             ActionOrder (from PolicyActionInPolicyRule)
```

4.7.1. The Reference GroupComponent

The property GroupComponent is inherited from PolicyActionInPolicyRule and is overridden to refer to an SARule instance. The [0..n] cardinality indicates that an SAAction instance may be contained in zero or more SARule instances.

4.7.2. The Reference PartComponent

The property PartComponent is inherited from PolicyActionInPolicyRule and is overridden to refer to an SAAction or CompoundPolicyAction instance. The [1..n] cardinality indicates that an SARule instance MUST contain at least one SAAction or CompoundPolicyAction instance.

4.7.3. The Property ActionOrder

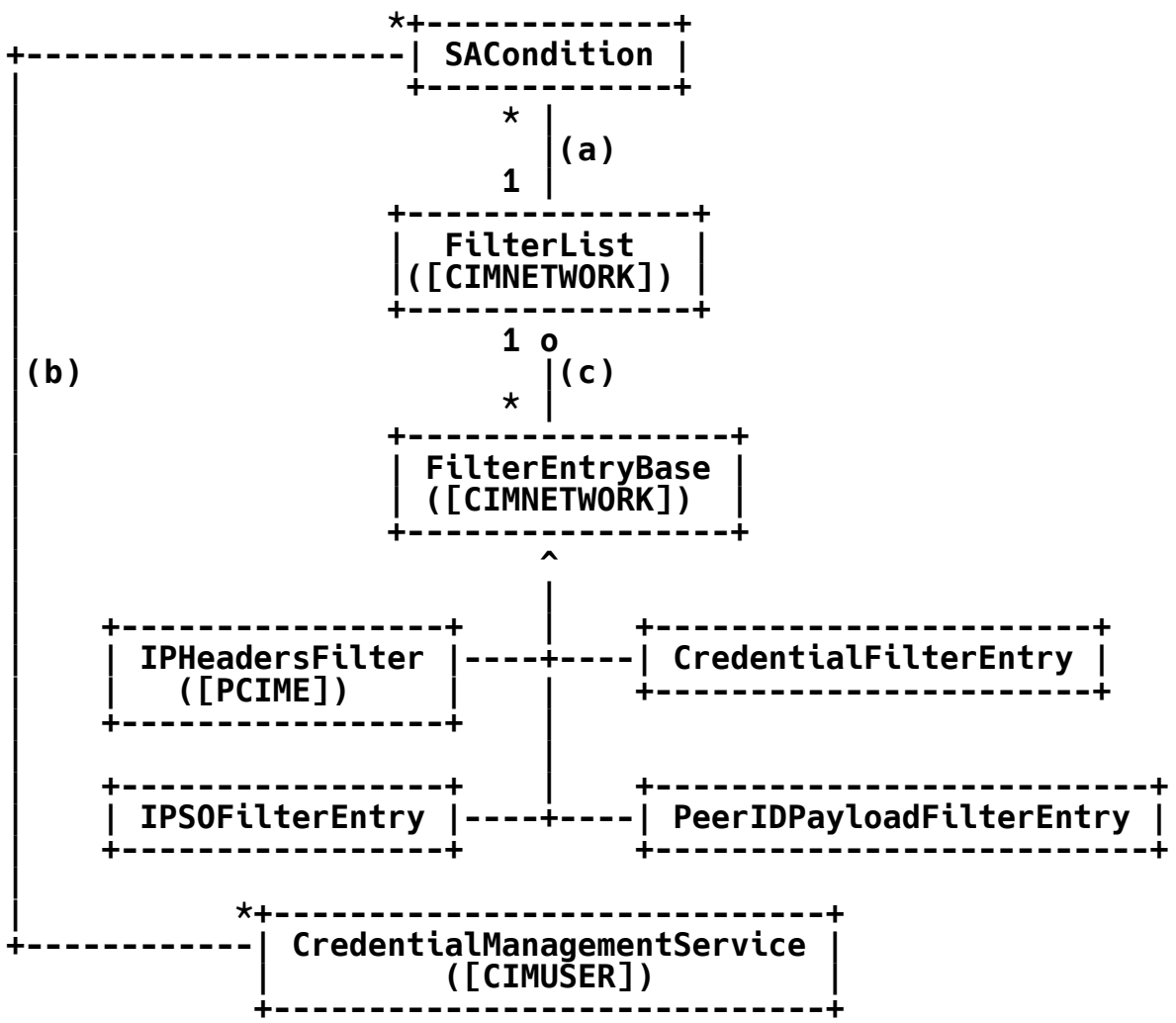
The property ActionOrder is inherited from the superclass PolicyActionInPolicyRule. It specifies the relative position of this PolicyAction in the sequence of actions associated with a PolicyRule. The ActionOrder MUST be unique so as to provide a deterministic order. In addition, the actions in an SARule are executed as follows. See section 4.2.2, ExecutionStrategy, for a discussion on the use of the ActionOrder property.

The property is defined as follows:

NAME	ActionOrder
DESCRIPTION	Specifies the order of actions.
SYNTAX	unsigned 16-bit integer
VALUE	Any value between 1 and 2^16-1 inclusive. Lower values have higher precedence (i.e., 1 is the highest precedence). The merging order of two SAActions with the same precedence is undefined.

5. Condition and Filter Classes

The IPsec condition and filter classes are used to build the "if" part of the IKE and IPsec rules.



(a) FilterOfSACondition
(b) AcceptCredentialsFrom
(c) EntriesInFilterList (see [CIMNETWORK])

5.1. The Class SACondition

The class SACondition defines the conditions of rules for IKE and IPsec negotiations. Conditions are associated with policy rules via the SAConditionInRule aggregation. It is used as an anchor point to associate various types of filters with policy rules via the FilterOfSACondition association. It also defines whether Credentials can be accepted for a particular policy rule via the AcceptCredentialsFrom association.

Associated objects represent components of the condition that may or may not apply at a given rule evaluation. For example, an AcceptCredentialsFrom evaluation is only performed when a credential is available to be evaluated against the list of trusted credential management services. Similarly, a PeerIDPayloadFilterEntry may only be evaluated when an IDPayload value is available to compare with the filter. Condition components that do not have corresponding values with which to evaluate are evaluated as TRUE unless the protocol has completed without providing the required information.

The class definition for SACondition is as follows:

NAME	SACondition
DESCRIPTION	Defines the preconditions for IKE and IPsec negotiations.
DERIVED FROM	PolicyCondition (see [PCIM])
ABSTRACT	FALSE
PROPERTIES	PolicyConditionName (from PolicyCondition)

5.2. The Class IPHeadersFilter

The class IPHeadersFilter is defined in [PCIME] with the following note:

1) to specify 5-tuple filters that are to apply symmetrically (i.e., matches traffic in both directions of the same flows which is quite typical for SPD entries for ingress and egress traffic), the Direction property of the FilterList SHOULD be set to "Mirrored".

5.3. The Class CredentialFilterEntry

The class CredentialFilterEntry defines an equivalence class that match credentials of IKE peers. Each CredentialFilterEntry includes a MatchFieldName that is interpreted according to the CredentialManagementService(s) associated with the SACondition (AcceptCredentialsFrom).

These credentials can be X.509 certificates, Kerberos tickets, or other types of credentials obtained during the Phase 1 exchange.

Note: this filter entry will probably be checked while the IKE negotiation takes place. If the check is a failure, then the IKE negotiation MUST be stopped, and the result of the IKEAction which triggered this negotiation is a failure.

The class definition for CredentialFilterEntry is as follows:

```
NAME         CredentialFilterEntry
DESCRIPTION  Specifies a match filter based on the IKE
             credentials.
DERIVED FROM FilterEntryBase (see [CIMNETWORK])
ABSTRACT     FALSE
PROPERTIES   Name (from FilterEntryBase)
             IsNegated (from FilterEntryBase)
             MatchFieldName
             MatchFieldValue
             CredentialType
```

5.3.1. The Property MatchFieldName

The property MatchFieldName specifies the sub-part of the credential to match against MatchFieldValue. The property is defined as follows:

```
NAME         MatchFieldName
DESCRIPTION  Specifies which sub-part of the credential to match.
SYNTAX       string
VALUE        This is the string representation of a X.509
             certificate attribute, e.g.:
             - "serialNumber"
             - "signatureAlgorithm"
             - "issuerName"
             - "subjectName"
             - "subjectAltName"
             - ...
```

5.3.2. The Property MatchFieldValue

The property MatchFieldValue specifies the value to compare with the MatchFieldName in a credential to determine if the credential matches this filter entry. The property is defined as follows:

```
NAME         MatchFieldValue
DESCRIPTION  Specifies the value to be matched by the
             MatchFieldName.
```

SYNTAX	string
VALUE	NB: If the CredentialFilterEntry corresponds to a DistinguishedName, this value in the CIM class is represented by an ordinary string value. However, an implementation must convert this string to a DER-encoded string before matching against the values extracted from credentials at runtime.

A wildcard mechanism may be used for MatchFieldNames that contain character strings. The MatchFieldValue may contain a wildcard character, '*', in the pattern match specification. For example, if the MatchFieldName is "subjectName", then a MatchFieldValue of "cn=*,ou=engineering,o=foo,c=be" will successfully match a certificate whose subject attribute is "cn=Jane Doe,ou=engineering,o=foo,c=be". The wildcard character can be used to represent 0 or more characters as would be displayed to the user (i.e., a wildcard pattern match operates on displayable character boundaries).

5.3.3. The Property CredentialType

The property CredentialType specifies the particular type of credential that is being matched. The property is defined as follows:

NAME	CredentialType
DESCRIPTION	Defines the type of IKE credentials.
SYNTAX	unsigned 16-bit integer
VALUE	1 - X.509 Certificate 2 - Kerberos Ticket

5.4. The Class IPSOFilterEntry

The class IPSOFilterEntry is used to match traffic based on the IP Security Options [IPSO] header values (ClassificationLevel and ProtectionAuthority) as defined in RFC 1108. This type of filter entry is used to adjust the IPsec encryption level according to the IPSO classification of the traffic (e.g., secret, confidential, restricted, etc.) The class definition for IPSOFilterEntry is as follows:

NAME	IPSOFilterEntry
DESCRIPTION	Specifies the a match filter based on IP Security Options.
DERIVED FROM	FilterEntryBase (see [CIMNETWORK])
ABSTRACT	FALSE

```
PROPERTIES   Name (from FilterEntryBase)
             IsNegated (from FilterEntryBase)
             MatchConditionType
             MatchConditionValue
```

5.4.1. The Property MatchConditionType

The property MatchConditionType specifies the IPSO header field that will be matched (e.g., traffic classification level or protection authority). The property is defined as follows:

```
NAME         MatchConditionType
DESCRIPTION  Specifies the IPSO header field to be matched.
SYNTAX       unsigned 16-bit integer
VALUE        1 - ClassificationLevel
             2 - ProtectionAuthority
```

5.4.2. The Property MatchConditionValue

The property MatchConditionValue specifies the value of the IPSO header field to be matched against. The property is defined as follows:

```
NAME         MatchConditionValue
DESCRIPTION  Specifies the value of the IPSO header field to be
             matched against.
SYNTAX       unsigned 16-bit integer
VALUE        The values MUST be one of values listed in RFC 1108
             (or any further IANA Assigned Numbers document).
             Some examples for ClassificationLevel are:
             61 - TopSecret
             90 - Secret
             150 - Confidential
             171 - Unclassified
             For ProtectionAuthority, some examples are:
             0 - GENSER
             1 - SIOP-ESI
             2 - SCI
             3 - NSA
             4 - DOE
```

5.5. The Class PeerIDPayloadFilterEntry

The class PeerIDPayloadFilterEntry defines filters used to match ID payload values from the IKE protocol exchange. PeerIDPayloadFilterEntry permits the specification of certain ID payload values such as "*@example.com" or "192.0.2.0/24".

Obviously this filter applies only to IKERules when acting as a responder. Moreover, this filter can be applied immediately in the case of aggressive mode but its application is to be delayed in the case of main mode. The class definition for PeerIDPayloadFilterEntry is as follows:

```
NAME          PeerIDPayloadFilterEntry
DESCRIPTION   Specifies a match filter based on IKE identity.
DERIVED FROM  FilterEntryBase (see [CIMNETWORK])
ABSTRACT      FALSE
PROPERTIES    Name (from FilterEntryBase)
              IsNegated (from FilterEntryBase)
              MatchIdentityType
              MatchIdentityValue
```

5.5.1. The Property MatchIdentityType

The property MatchIdentityType specifies the type of identity provided by the peer in the ID payload. The property is defined as follows:

```
NAME          MatchIdentityType
DESCRIPTION   Specifies the ID payload type.
SYNTAX        unsigned 16-bit integer
VALUE         Consult [DOI] for valid values.
```

5.5.2. The Property MatchIdentityValue

The property MatchIdentityValue specifies the filter value for comparison with the ID payload, e.g., "*@example.com". The property is defined as follows:

```
NAME          MatchIdentityValue
DESCRIPTION   Specifies the ID payload value.
SYNTAX        string
VALUE         NB: The syntax may need to be converted for
              comparison. If the PeerIDPayloadFilterEntry type is
              a DistinguishedName, the name in the
              MatchIdentityValue property is represented by an
              ordinary string value, but this value must be
              converted into a DER-encoded string before matching
              against the values extracted from IKE ID payloads at
              runtime. The same applies to IPv4 & IPv6 addresses.
```

Different wildcard mechanisms can be used depending on the ID payload:

- a MatchIdentityValue of "*@example.com" will match a user FQDN ID payload of "JDOE@EXAMPLE.COM".

- a MatchIdentityValue of "*.example.com" will match a FQDN ID payload of "WWW.EXAMPLE.COM".

- a MatchIdentityValue of "cn=*,ou=engineering,o=company,c=us" will match a DER DN ID payload of "cn=John Doe,ou=engineering,o=company,c=us".

- a MatchIdentityValue of "193.190.125.0/24" will match an IPv4 address ID payload of 193.190.125.10.

- a MatchIdentityValue of "193.190.125.*" will also match an IPv4 address ID payload of 193.190.125.10.

The above wildcard mechanisms MUST be supported for all ID payloads supported by the local IKE entity. The character '*' replaces 0 or multiple instances of any character as restricted by the type specified by MatchIdentityType.

5.6. The Association Class FilterOfSACondition

The class FilterOfSACondition associates an SACondition with the filter specifications (FilterList) that make up the condition. The class definition for FilterOfSACondition is as follows:

```
NAME         FilterOfSACondition
DESCRIPTION  Associates a condition with the filter list that
             makes up the individual condition elements.
DERIVED FROM Dependency (see [CIMCORE])
ABSTRACT     FALSE
PROPERTIES   Antecedent [ref FilterList[1..1]]
             Dependent [ref SACondition[0..n]]
```

5.6.1. The Reference Antecedent

The property Antecedent is inherited from Dependency and is overridden to refer to a FilterList instance. The [1..1] cardinality indicates that an SACondition instance MUST be associated with one and only one FilterList instance.

5.6.2. The Reference Dependent

The property Dependent is inherited from Dependency and is overridden to refer to an SACondition instance. The [0..n] cardinality indicates that a FilterList instance may be associated with zero or more SACondition instances.

5.7. The Association Class AcceptCredentialFrom

The class AcceptCredentialFrom specifies which credential management services (e.g., a CertificateAuthority or a Kerberos service) are to be trusted to certify peer credentials. This is used to assure that the credential being matched in the CredentialFilterEntry is a valid credential that has been supplied by an approved CredentialManagementService. If a CredentialManagementService is specified and a corresponding CredentialFilterEntry is used, but the credential supplied by the peer is not certified by that CredentialManagementService (or one of the CredentialManagementServices in its trust hierarchy), the CredentialFilterEntry is deemed not to match. If a credential is certified by a CredentialManagementService in the AcceptCredentialsFrom list of services, but there is no CredentialFilterEntry, this is considered equivalent to a CredentialFilterEntry that matches all credentials from those services.

The class definition for AcceptCredentialFrom is as follows:

```
NAME         AcceptCredentialFrom
DESCRIPTION  Associates a condition with the credential management
             services to be trusted.
DERIVED FROM Dependency (see [CIMCORE])
ABSTRACT     FALSE
PROPERTIES   Antecedent [ref CredentialManagementService[0..n]]
             Dependent [ref SACondition[0..n]]
```

5.7.1. The Reference Antecedent

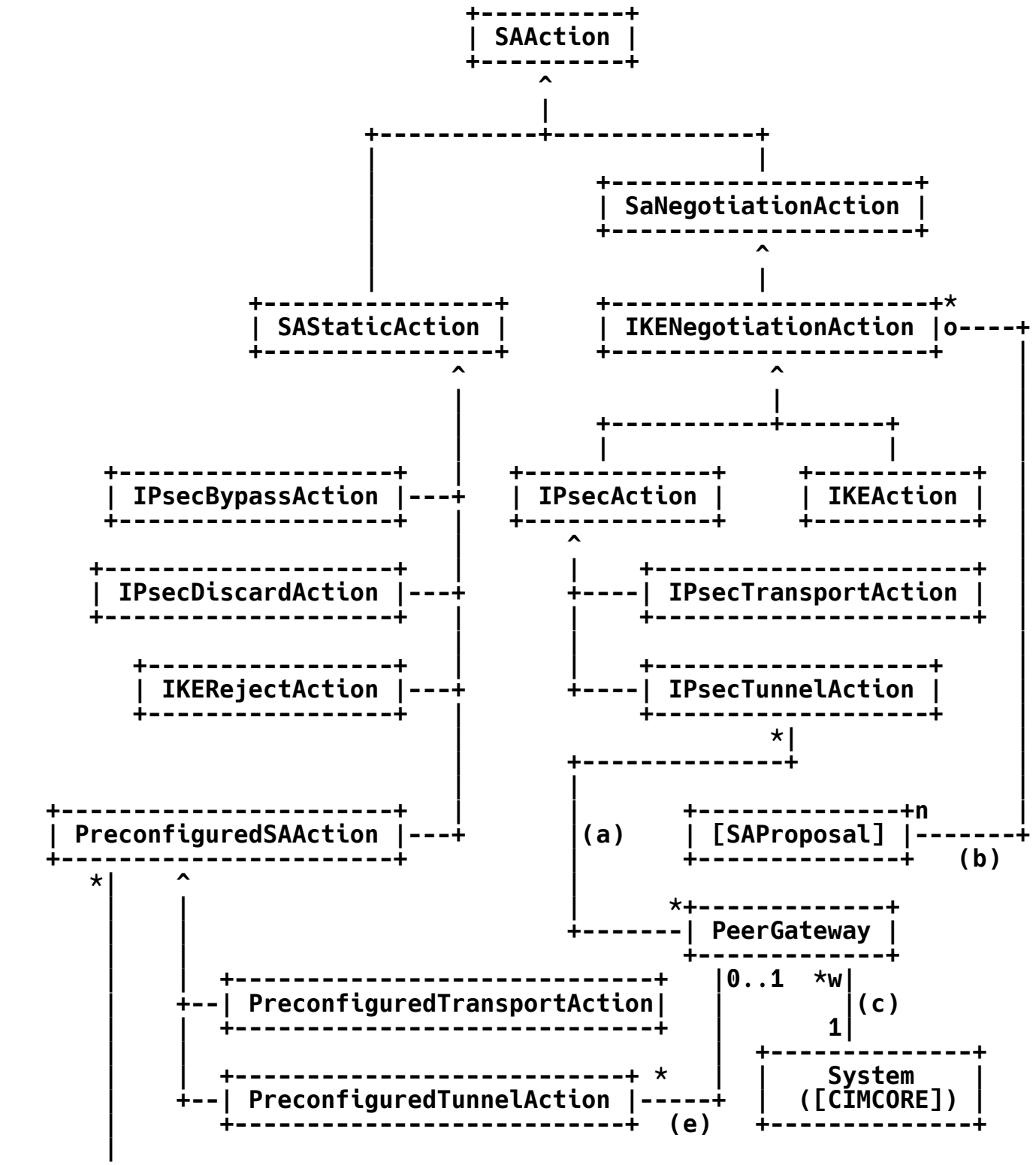
The property Antecedent is inherited from Dependency and is overridden to refer to a CredentialManagementService instance. The [0..n] cardinality indicates that an SACondition instance may be associated with zero or more CredentialManagementService instances.

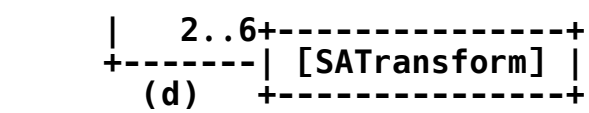
5.7.2. The Reference Dependent

The property Dependent is inherited from Dependency and is overridden to refer to a SACondition instance. The [0..n] cardinality indicates that a CredentialManagementService instance may be associated with zero or more SACondition instances.

6. Action Classes

The action classes are used to model the different actions an IPsec device may take when the evaluation of the associated condition results in a match.


SAAction
SaNegotiationAction
SAStaticAction
IKENegotiationAction
IPsecBypassAction
IPsecAction
IKEAction
IPsecDiscardAction
IPsecTransportAction
IKERejectAction
IPsecTunnelAction
PreconfiguredSAAction
[SAProposal]
(a)
(b)
PeerGateway
PreconfiguredTransportAction
PreconfiguredTunnelAction
0..1
(c)
(e)
System
([CIMCORE])



(a) PeerGatewayForTunnel
(b) ContainedProposal
(c) HostedPeerGatewayInformation
(d) TransformOfPreconfiguredAction
(e) PeerGatewayForPreconfiguredTunnel

6.1. The Class SAAction

The class SAAction is abstract and serves as the base class for IKE and IPsec actions. It is used for aggregating different types of actions to IKE and IPsec rules. The class definition for SAAction is as follows:

NAME	SAAction
DESCRIPTION	The base class for IKE and IPsec actions.
DERIVED FROM	PolicyAction (see [PCIM])
ABSTRACT	TRUE
PROPERTIES	PolicyActionName (from PolicyAction) DoActionLogging DoPacketLogging

6.1.1. The Property DoActionLogging

The property DoActionLogging specifies whether a log message is to be generated when the action is performed. This applies for SANegotiationActions with the meaning of logging a message when the negotiation is attempted (with the success or failure result). This also applies for SAStaticAction only for PreconfiguredSAAction with the meaning of logging a message when the preconfigured SA is actually installed in the SADB. The property is defined as follows:

NAME	DoActionLogging
DESCRIPTION	Specifies the whether to log when the action is performed.
SYNTAX	boolean
VALUE	true - a log message is to be generated when action is performed. false - no log message is to be generated when action is performed.

6.1.2. The Property DoPacketLogging

The property DoPacketLogging specifies whether a log message is to be generated when the resulting security association is used to process the packet. If the SANegotiationAction successfully executes and results in the creation of one or several security associations, or if the PreconfiguredSAAction executes, the value of DoPacketLogging SHOULD be propagated to an optional field of SADB. This optional field should be used to decide whether a log message is to be generated when the SA is used to process a packet. For SAStaticActions, a log message is to be generated when the IPsecBypassAction, IPsecDiscardAction, or IKERejectAction are executed. The property is defined as follows:

NAME	DoPacketLogging
DESCRIPTION	Specifies whether to log when the resulting security association is used to process the packet.
SYNTAX	boolean
VALUE	true - a log message is to be generated when the resulting security association is used to process the packet. false - no log message is to be generated.

6.2. The Class SAStaticAction

The class SAStaticAction is abstract and serves as the base class for IKE and IPsec actions that do not require any negotiation. The class definition for SAStaticAction is as follows:

NAME	SAStaticAction
DESCRIPTION	The base class for IKE and IPsec actions that do not require any negotiation.
DERIVED FROM	SAAction
ABSTRACT	TRUE
PROPERTIES	LifetimeSeconds

6.2.1. The Property LifetimeSeconds

The property LifetimeSeconds specifies how long the security association derived from this action should be used. The property is defined as follows:

NAME	LifetimeSeconds
DESCRIPTION	Specifies the amount of time (in seconds) that a security association derived from this action should be used.
SYNTAX	unsigned 64-bit integer

VALUE	A value of zero indicates that there is not a lifetime associated with this action (i.e., infinite lifetime). A non-zero value is typically used in conjunction with alternate SAActions performed when there is a negotiation failure of some sort.

Note: if the referenced SAStaticAction object is a PreconfiguredSAAction associated to several SATransforms, then the actual lifetime of the preconfigured SA will be the lesser of the value of this LifetimeSeconds property and of the value of the MaxLifetimeSeconds property of the associated SATransform. If the value of this LifetimeSeconds property is zero, then there will be no lifetime associated to this SA.

Note: while some SA negotiation protocols [IKE] can negotiate the lifetime as an arbitrary length field, the authors have assumed that a 64-bit integer will be sufficient.

It is expected that most SAStaticAction instances will have their LifetimeSeconds properties set to zero (meaning no expiration of the resulting SA).

6.3. The Class IPsecBypassAction

The class IPsecBypassAction is used when packets are allowed to be processed without applying IPsec encapsulation to them. This is the same as stating that packets are allowed to flow in the clear. The class definition for IPsecBypassAction is as follows:

NAME	IPsecBypassAction
DESCRIPTION	Specifies that packets are to be allowed to pass in the clear.
DERIVED FROM	SAStaticAction
ABSTRACT	FALSE

6.4. The Class IPsecDiscardAction

The class IPsecDiscardAction is used when packets are to be discarded. This is the same as stating that packets are to be denied. The class definition for IPsecDiscardAction is as follows:

NAME	IPsecDiscardAction
DESCRIPTION	Specifies that packets are to be discarded.
DERIVED FROM	SAStaticAction
ABSTRACT	FALSE

6.5. The Class IKERejectAction

The class IKERejectAction is used to prevent attempting an IKE negotiation with the peer(s). The main use of this class is to prevent some denial of service attacks when acting as IKE responder. It goes beyond a plain discard of UDP/500 IKE packets because the SACondition can be based on specific PeerIDPayloadFilterEntry (when aggressive mode is used). The class definition for IKERejectAction is as follows:

```
NAME         IKERejectAction
DESCRIPTION  Specifies that an IKE negotiation should not even be
             attempted or continued.
DERIVED FROM SAStaticAction
ABSTRACT     FALSE
```

6.6. The Class PreconfiguredSAAction

The class PreconfiguredSAAction is used to create a security association using preconfigured, hard-wired algorithms and keys.

Notes:

- the SPI for a PreconfiguredSAAction is contained in the association, TransformOfPreconfiguredAction;

- the session key (if applicable) is contained in an instance of the class SharedSecret (see [CIMUSER]). The session key is stored in the property Secret, the property protocol contains either "ESP-encrypt", "ESP-auth" or "AH", the property algorithm contains the algorithm used to protect the secret (can be "PLAINTEXT" if the IPsec entity has no secret storage), the value of property RemoteID is the concatenation of the remote IPsec peer IP address in dotted decimal, of the character "/", of "IN" (respectively "OUT") for inbound SA (respectively outbound SA), of the character "/", and of the hexadecimal representation of the SPI.

Although the class is concrete, it MUST not be instantiated. The class definition for PreconfiguredSAAction is as follows:

```
NAME         PreconfiguredSAAction
DESCRIPTION  Specifies preconfigured algorithm and keying
             information for creation of a security association.
DERIVED FROM SAStaticAction
ABSTRACT     TRUE
PROPERTIES   LifetimeKilobytes
```

6.6.1. The Property LifetimeKilobytes

The property LifetimeKilobytes specifies a traffic limit in kilobytes that can be consumed before the SA is deleted. The property is defined as follows:

NAME	LifetimeKilobytes
DESCRIPTION	Specifies the SA lifetime in kilobytes.
SYNTAX	unsigned 64-bit integer
VALUE	A value of zero indicates that there is not a lifetime associated with this action (i.e., infinite lifetime). A non-zero value is used to indicate that after this number of kilobytes has been consumed the SA must be deleted from the SADB.

Note: the actual lifetime of the preconfigured SA will be the lesser of the value of this LifetimeKilobytes property and of the value of the MaxLifetimeSeconds property of the associated SATransform. If the value of this LifetimeKilobytes property is zero, then there will be no lifetime associated with this action.

Note: while some SA negotiation protocols [IKE] can negotiate the lifetime as an arbitrary length field, the authors have assumed that a 64-bit integer will be sufficient.

It is expected that most PreconfiguredSAAction instances will have their LifetimeKilobyte properties set to zero (meaning no expiration of the resulting SA).

6.7. The Class PreconfiguredTransportAction

The class PreconfiguredTransportAction is used to create an IPsec transport-mode security association using preconfigured, hard-wired algorithms and keys. The class definition for PreconfiguredTransportAction is as follows:

NAME	PreconfiguredTransportAction
DESCRIPTION	Specifies preconfigured algorithm and keying information for creation of an IPsec transport security association.
DERIVED FROM	PreconfiguredSAAction
ABSTRACT	FALSE

6.8. The Class PreconfiguredTunnelAction

The class PreconfiguredTunnelAction is used to create an IPsec tunnel-mode security association using preconfigured, hard-wired algorithms and keys. The class definition for PreconfiguredSAAction is as follows:

NAME	PreconfiguredTunnelAction
DESCRIPTION	Specifies preconfigured algorithm and keying information for creation of an IPsec tunnel-mode security association.
DERIVED FROM	PreconfiguredSAAction
ABSTRACT	FALSE
PROPERTIES	DFHandling

6.8.1. The Property DFHandling

The property DFHandling specifies how the Don't Fragment (DF) bit of the internal IP header is to be handled during IPsec processing. The property is defined as follows:

NAME	DFHandling
DESCRIPTION	Specifies the processing of the DF bit.
SYNTAX	unsigned 16-bit integer
VALUE	1 - Copy the DF bit from the internal IP header to the external IP header. 2 - Set the DF bit of the external IP header to 1. 3 - Clear the DF bit of the external IP header to 0.

6.9. The Class SANegotiationAction

The class SANegotiationAction specifies an action requesting security policy negotiation.

This is an abstract class. Currently, only one security policy negotiation protocol action is subclassed from SANegotiationAction: the IKENegotiationAction class. It is nevertheless expected that other security policy negotiation protocols will exist and the negotiation actions of those new protocols would be modeled as a subclass of SANegotiationAction.

NAME	SANegotiationAction
DESCRIPTION	Specifies a negotiation action.
DERIVED FROM	SAAction
ABSTRACT	TRUE

6.10. The Class IKENegotiationAction

The class IKENegotiationAction is abstract and serves as the base class for IKE and IPsec actions that result in an IKE negotiation. The class definition for IKENegotiationAction is as follows:

NAME	IKENegotiationAction
DESCRIPTION	A base class for IKE and IPsec actions that specifies the parameters that are common for IKE phase 1 and IKE phase 2 IPsec DOI negotiations.
DERIVED FROM	SANegotiationAction
ABSTRACT	TRUE
PROPERTIES	MinLifetimeSeconds MinLifetimeKilobytes IdleDurationSeconds

6.10.1. The Property MinLifetimeSeconds

The property MinLifetimeSeconds specifies the minimum seconds in a lifetime that will be accepted from the peer. MinLifetimeSeconds is used to prevent certain denial of service attacks where the peer requests an arbitrarily low lifetime value, causing renegotiations with expensive Diffie-Hellman operations. The property is defined as follows:

NAME	MinLifetimeSeconds
DESCRIPTION	Specifies the minimum seconds acceptable in a lifetime.
SYNTAX	unsigned 64-bit integer
VALUE	A value of zero indicates that there is no minimum value. A non-zero value specifies the minimum seconds lifetime.

Note: while IKE can negotiate the lifetime as an arbitrary length field, the authors have assumed that a 64-bit integer will be sufficient.

6.10.2. The Property MinLifetimeKilobytes

The property MinLifetimeKilobytes specifies the minimum kilobytes of a lifetime that will be accepted from the peer. MinLifetimeKilobytes is used to prevent certain denial of service attacks, where the peer requests an arbitrarily low lifetime value, causing renegotiations with correspondingly expensive Diffie-Hellman operations. Note that there has been considerable debate regarding the usefulness of applying kilobyte lifetimes to IKE phase 1 security associations, so it is likely that this property will only apply to the sub-class IPsecAction. The property is defined as follows:

NAME	MinLifetimeKilobytes
DESCRIPTION	Specifies the minimum kilobytes acceptable in a lifetime.
SYNTAX	unsigned 64-bit integer
VALUE	A value of zero indicates that there is no minimum value. A non-zero value specifies the minimum kilobytes lifetime.

Note: While IKE can negotiate the lifetime as an arbitrary length field, the authors have assumed that a 64-bit integer will be sufficient.

6.10.3. The Property IdleDurationSeconds

The property IdleDurationSeconds specifies how many seconds a security association may remain idle (i.e., no traffic protected using the security association) before it is deleted. The property is defined as follows:

NAME	IdleDurationSeconds
DESCRIPTION	Specifies how long, in seconds, a security association may remain unused before it is deleted.
SYNTAX	unsigned 64-bit integer
VALUE	A value of zero indicates that idle detection should not be used for the security association (only the seconds and kilobyte lifetimes will be used). Any non-zero value indicates the number of seconds the security association may remain unused.

6.11. The Class IPsecAction

The class IPsecAction serves as the base class for IPsec transport and tunnel actions. It specifies the parameters used for an IKE phase 2 IPsec DOI negotiation. The class definition for IPsecAction is as follows:

NAME	IPsecAction
DESCRIPTION	A base class for IPsec transport and tunnel actions that specifies the parameters for IKE phase 2 IPsec DOI negotiations.
DERIVED FROM	IKENegotiationAction
ABSTRACT	TRUE
PROPERTIES	UsePFS UseIKEGroup GroupId Granularity VendorID

6.11.1. The Property UsePFS

The property UsePFS specifies whether or not perfect forward secrecy should be used when refreshing keys. The property is defined as follows:

NAME	UsePFS
DESCRIPTION	Specifies the whether or not to use PFS when refreshing keys.
SYNTAX	boolean
VALUE	A value of true indicates that PFS should be used. A value of false indicates that PFS should not be used.

6.11.2. The Property UseIKEGroup

The property UseIKEGroup specifies whether or not phase 2 should use the same key exchange group as was used in phase 1. UseIKEGroup is ignored if UsePFS is false. The property is defined as follows:

NAME	UseIKEGroup
DESCRIPTION	Specifies whether or not to use the same GroupId for phase 2 as was used in phase 1. If UsePFS is false, then UseIKEGroup is ignored.
SYNTAX	boolean
VALUE	A value of true indicates that the phase 2 GroupId should be the same as phase 1. A value of false indicates that the property GroupId will contain the key exchange group to use for phase 2.

6.11.3. The Property GroupId

The property GroupId specifies the key exchange group to use for phase 2. GroupId is ignored if (1) the property UsePFS is false, or (2) the property UsePFS is true and the property UseIKEGroup is true. If the GroupID number is from the vendor-specific range (32768-65535), the property VendorID qualifies the group number. The property is defined as follows:

NAME	GroupId
DESCRIPTION	Specifies the key exchange group to use for phase 2 when the property UsePFS is true and the property UseIKEGroup is false.
SYNTAX	unsigned 16-bit integer
VALUE	Consult [IKE] for valid values.

6.11.4. The Property Granularity

The property Granularity specifies how the selector for the security association should be derived from the traffic that triggered the negotiation. The property is defined as follows:

NAME	Granularity
DESCRIPTION	Specifies how the proposed selector for the security association will be created.
SYNTAX	unsigned 16-bit integer
VALUE	1 - subnet: the source and destination subnet masks of the filter entry are used. 2 - address: only the source and destination IP addresses of the triggering packet are used. 3 - protocol: the source and destination IP addresses and the IP protocol of the triggering packet are used. 4 - port: the source and destination IP addresses and the IP protocol and the source and destination layer 4 ports of the triggering packet are used.

6.11.5. The Property VendorID

The property VendorID is used together with the property GroupID (when it is in the vendor-specific range) to identify the key exchange group. VendorID is ignored unless UsePFS is true and UseIKEGroup is false and GroupID is in the vendor-specific range (32768-65535). The property is defined as follows:

NAME	VendorID
DESCRIPTION	Specifies the IKE Vendor ID.
SYNTAX	string

6.12. The Class IPsecTransportAction

The class IPsecTransportAction is a subclass of IPsecAction that is used to specify use of an IPsec transport-mode security association. The class definition for IPsecTransportAction is as follows:

NAME	IPsecTransportAction
DESCRIPTION	Specifies that an IPsec transport-mode security association should be negotiated.
DERIVED FROM	IPsecAction
ABSTRACT	FALSE

6.13. The Class IPsecTunnelAction

The class IPsecTunnelAction is a subclass of IPsecAction that is used to specify use of an IPsec tunnel-mode security association. The class definition for IPsecTunnelAction is as follows:

```
NAME          IPsecTunnelAction
DESCRIPTION   Specifies that an IPsec tunnel-mode security
              association should be negotiated.
DERIVED FROM  IPsecAction
ABSTRACT      FALSE
PROPERTIES    DFHandling
```

6.13.1. The Property DFHandling

The property DFHandling specifies how the tunnel should manage the Don't Fragment (DF) bit. The property is defined as follows:

```
NAME          DFHandling
DESCRIPTION   Specifies how to process the DF bit.
SYNTAX        unsigned 16-bit integer
VALUE         1 - Copy the DF bit from the internal IP header to
              the external IP header.
              2 - Set the DF bit of the external IP header to 1.
              3 - Clear the DF bit of the external IP header to 0.
```

6.14. The Class IKEAction

The class IKEAction specifies the parameters that are to be used for IKE phase 1 negotiation. The class definition for IKEAction is as follows:

```
NAME          IKEAction
DESCRIPTION   Specifies the IKE phase 1 negotiation parameters.
DERIVED FROM  IKENegotiationAction
ABSTRACT      FALSE
PROPERTIES    ExchangeMode
              UseIKEIdentityType
              VendorID
              AggressiveModeGroupId
```

6.14.1. The Property ExchangeMode

The property ExchangeMode specifies which IKE mode should be used for IKE phase 1 negotiations. The property is defined as follows:

```
NAME         ExchangeMode
DESCRIPTION  Specifies the IKE negotiation mode for phase 1.
SYNTAX       unsigned 16-bit integer
VALUE        1 - base mode
             2 - main mode
             4 - aggressive mode
```

6.14.2. The Property UseIKEIdentityType

The property UseIKEIdentityType specifies what IKE identity type should be used when negotiating with the peer. This information is used in conjunction with the IKE identities available on the system and the IdentityContexts of the matching IKERule. The property is defined as follows:

```
NAME         UseIKEIdentityType
DESCRIPTION  Specifies the IKE identity to use during negotiation.
SYNTAX       unsigned 16-bit integer
VALUE        Consult [DOI] for valid values.
```

6.14.3. The Property VendorID

The property VendorID specifies the value to be used in the Vendor ID payload. The property is defined as follows:

```
NAME         VendorID
DESCRIPTION  Vendor ID Payload.
SYNTAX       string
VALUE        A value of NULL means that Vendor ID payload will be
             neither generated nor accepted. A non-NULL value
             means that a Vendor ID payload will be generated
             (when acting as an initiator) or is expected (when
             acting as a responder).
```

6.14.4. The Property AggressiveModeGroupId

The property AggressiveModeGroupId specifies which group ID is to be used in the first packets of the phase 1 negotiation. This property is ignored unless the property ExchangeMode is set to 4 (aggressive mode). If the AggressiveModeGroupID number is from the vendor-specific range (32768-65535), the property VendorID qualifies the group number. The property is defined as follows:

```
NAME          AggressiveModeGroupId
DESCRIPTION   Specifies the group ID to be used for aggressive
              mode.
SYNTAX        unsigned 16-bit integer
```

6.15. The Class PeerGateway

The class PeerGateway specifies the security gateway with which the IKE services negotiates. The class definition for PeerGateway is as follows:

```
NAME          PeerGateway
DESCRIPTION   Specifies the security gateway with which to
              negotiate.
DERIVED FROM  LogicalElement (see [CIMCORE])
ABSTRACT      FALSE
PROPERTIES    Name
              PeerIdentityType
              PeerIdentity
```

Note: The class PeerIdentityEntry contains more information about the peer (namely its IP address).

6.15.1. The Property Name

The property Name specifies a user-friendly name for this security gateway. The property is defined as follows:

```
NAME          Name
DESCRIPTION   Specifies a user-friendly name for this security
              gateway.
SYNTAX        string
```

6.15.2. The Property PeerIdentityType

The property PeerIdentityType specifies the IKE identity type of the security gateway. The property is defined as follows:

```
NAME          PeerIdentityType
DESCRIPTION   Specifies the IKE identity type of the security
              gateway.
SYNTAX        unsigned 16-bit integer
VALUE         Consult [DOI] for valid values.
```

6.15.3. The Property PeerIdentity

The property PeerIdentity specifies the IKE identity value of the security gateway. Based upon the storage chosen for the task-specific mapping of the information model, a conversion may be needed from the stored representation of the PeerIdentity string to the real value used in the ID payload (e.g., IP address is to be converted from a dotted decimal string into 4 bytes). The property is defined as follows:

```
NAME         PeerIdentity
DESCRIPTION  Specifies the IKE identity value of the security
             gateway.
SYNTAX       string
```

6.16. The Association Class PeerGatewayForTunnel

The class PeerGatewayForTunnel associates IPsecTunnelActions with an ordered list of PeerGateways. The class definition for PeerGatewayForTunnel is as follows:

```
NAME         PeerGatewayForTunnel
DESCRIPTION  Associates IPsecTunnelActions with an ordered list of
             PeerGateways.
DERIVED FROM Dependency (see [CIMCORE])
ABSTRACT     FALSE
PROPERTIES   Antecedent [ref PeerGateway[0..n]]
             Dependent [ref IPsecTunnelAction[0..n]]
             SequenceNumber
```

6.16.1. The Reference Antecedent

The property Antecedent is inherited from Dependency and is overridden to refer to a PeerGateway instance. The [0..n] cardinality indicates that an IPsecTunnelAction instance may be associated with zero or more PeerGateway instances.

Note: The cardinality 0 has a specific meaning:

- when the IKE service acts as a responder, this means that the IKE service will accept phase 1 negotiation with any other security gateway;

- when the IKE service acts as an initiator, this means that the IKE service will use the destination IP address (of the IP packets which triggered the SARule) as the IP address of the peer IKE entity.

6.16.2. The Reference Dependent

The property Dependent is inherited from Dependency and is overridden to refer to an IPsecTunnelAction instance. The [0..n] cardinality indicates that a PeerGateway instance may be associated with zero or more IPsecTunnelAction instances.

6.16.3. The Property SequenceNumber

The property SequenceNumber specifies the ordering to be used when evaluating PeerGateway instances for a given IPsecTunnelAction. The property is defined as follows:

```
NAME         SequenceNumber
DESCRIPTION  Specifies the order of evaluation for PeerGateways.
SYNTAX       unsigned 16-bit integer
VALUE        Lower values are evaluated first.
```

6.17. The Aggregation Class ContainedProposal

The class ContainedProposal associates an ordered list of SAProposals with the IKENegotiationAction that aggregates it. If the referenced IKENegotiationAction object is an IKEAction, then the referenced SAProposal object(s) must be IKEProposal(s). If the referenced IKENegotiationAction object is an IPsecTransportAction or an IPsecTunnelAction, then the referenced SAProposal object(s) must be IPsecProposal(s). The class definition for ContainedProposal is as follows:

```
NAME         ContainedProposal
DESCRIPTION  Associates an ordered list of SAProposals with an
             IKENegotiationAction.
DERIVED FROM PolicyComponent (see [PCIM])
ABSTRACT     FALSE
PROPERTIES   GroupComponent[ref IKENegotiationAction[0..n]]
             PartComponent[ref SAProposal[1..n]]
             SequenceNumber
```

6.17.1. The Reference GroupComponent

- The property GroupComponent is inherited from PolicyComponent and is overridden to refer to an IKENegotiationAction instance. The [0..n] cardinality indicates that an SAProposal instance may be associated with zero or more IKENegotiationAction instances.

6.17.2. The Reference PartComponent

The property PartComponent is inherited from PolicyComponent and is overridden to refer to an SAProposal instance. The [1..n] cardinality indicates that an IKENegotiationAction instance MUST be associated with at least one SAProposal instance.

6.17.3. The Property SequenceNumber

The property SequenceNumber specifies the order of preference for the SAProposals. The property is defined as follows:

NAME	SequenceNumber
DESCRIPTION	Specifies the preference order for the SAProposals.
SYNTAX	unsigned 16-bit integer
VALUE	Lower-valued proposals are preferred over proposals with higher values. For ContainedProposals that reference the same IKENegotiationAction, SequenceNumber values must be unique.

6.18. The Association Class HostedPeerGatewayInformation

The class HostedPeerGatewayInformation weakly associates a PeerGateway with a System. The class definition for HostedPeerGatewayInformation is as follows:

NAME	HostedPeerGatewayInformation
DESCRIPTION	Weakly associates a PeerGateway with a System.
DERIVED FROM	Dependency (see [CIMCORE])
ABSTRACT	FALSE
PROPERTIES	Antecedent [ref System[1..1]] Dependent [ref PeerGateway[0..n] [weak]]

6.18.1. The Reference Antecedent

The property Antecedent is inherited from Dependency and is overridden to refer to a System instance. The [1..1] cardinality indicates that a PeerGateway instance MUST be associated with one and only one System instance.

6.18.2. The Reference Dependent

The property Dependent is inherited from Dependency and is overridden to refer to a PeerGateway instance. The [0..n] cardinality indicates that a System instance may be associated with zero or more PeerGateway instances.

6.19. The Association Class TransformOfPreconfiguredAction

The class TransformOfPreconfiguredAction associates a PreconfiguredSAAction with two, four or six SATransforms that will be applied to the inbound and outbound traffic. The order of application of the SATransforms is implicitly defined in [IPSEC]. The class definition for TransformOfPreconfiguredAction is as follows:

NAME	TransformOfPreconfiguredAction
DESCRIPTION	Associates a PreconfiguredSAAction with from one to three SATransforms.
DERIVED FROM	Dependency (see [CIMCORE])
ABSTRACT	FALSE
PROPERTIES	Antecedent[ref SATransform[2..6]]
	Dependent[ref PreconfiguredSAAction[0..n]]
	SPI
	Direction

6.19.1. The Reference Antecedent

The property Antecedent is inherited from Dependency and is overridden to refer to an SATransform instance. The [2..6] cardinality indicates that a PreconfiguredSAAction instance may be associated with two to six SATransform instances.

6.19.2. The Reference Dependent

The property Dependent is inherited from Dependency and is overridden to refer to a PreconfiguredSAAction instance. The [0..n] cardinality indicates that a SATransform instance may be associated with zero or more PreconfiguredSAAction instances.

6.19.3. The Property SPI

The property SPI specifies the SPI to be used by the pre-configured action for the associated transform. The property is defined as follows:

NAME	SPI
DESCRIPTION	Specifies the SPI to be used with the SATransform.
SYNTAX	unsigned 32-bit integer

6.19.4. The Property Direction

The property Direction specifies whether the SPI property is for inbound or outbound traffic. The property is defined as follows:

```
NAME         Direction
DESCRIPTION Specifies whether the SA is for inbound or outbound
            traffic.
SYNTAX      unsigned 8-bit integer
VALUE       1 - this SA is for inbound traffic
            2 - this SA is for outbound traffic
```

6.20 The Association Class PeerGatewayForPreconfiguredTunnel

The class PeerGatewayForPreconfiguredTunnel associates zero or one PeerGateways with multiple PreconfiguredTunnelActions. The class definition for PeerGatewayForPreconfiguredTunnel is as follows:

```
NAME         PeerGatewayForPreconfiguredTunnel
DESCRIPTION  Associates a PeerGateway with multiple
             PreconfiguredTunnelActions.
DERIVED FROM Dependency (see [CIMCORE])
ABSTRACT     FALSE
PROPERTIES   Antecedent[ref PeerGateway[0..1]]
             Dependent[ref PreconfiguredTunnelAction[0..n]]
```

6.20.1. The Reference Antecedent

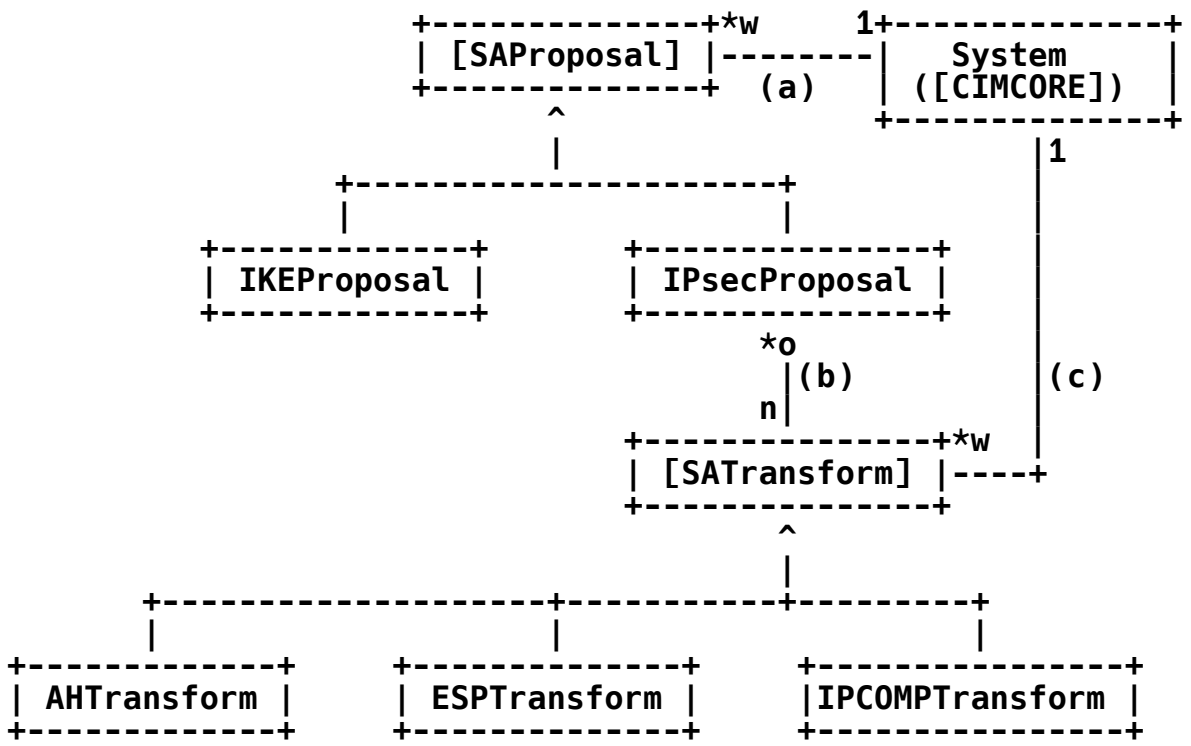
The property Antecedent is inherited from Dependency and is overridden to refer to a PeerGateway instance. The [0..1] cardinality indicates that a PreconfiguredTunnelAction instance may be associated with one PeerGteway instance.

6.20.2. The Reference Dependent

The property Dependent is inherited from Dependency and is overridden to refer to a PreconfiguredTunnelAction instance. The [0..n] cardinality indicates that a PeerGateway instance may be associated with zero or more PreconfiguredSAAction instances.

7. Proposal and Transform Classes

The proposal and transform classes model the proposal settings an IPsec device will use during IKE phase 1 and 2 negotiations.



(a) SAProposalInSystem
(b) ContainedTransform
(c) SATransformInSystem

7.1. The Abstract Class SAProposal

The abstract class SAProposal serves as the base class for the IKE and IPsec proposal classes. It specifies the parameters that are common to the two proposal types. The class definition for SAProposal is as follows:

NAME	SAProposal
DESCRIPTION	Specifies the common proposal parameters for IKE and IPsec security association negotiation.
DERIVED FROM	Policy ([PCIM])
ABSTRACT	TRUE
PROPERTIES	Name

7.1.1. The Property Name

The property Name specifies a user-friendly name for the SAProposal. The property is defined as follows:

```
NAME         Name
DESCRIPTION  Specifies a user-friendly name for this proposal.
SYNTAX       string
```

7.2. The Class IKEProposal

The class IKEProposal specifies the proposal parameters necessary to drive an IKE security association negotiation. The class definition for IKEProposal is as follows:

```
NAME         IKEProposal
DESCRIPTION  Specifies the proposal parameters for IKE security
             association negotiation.
DERIVED FROM SAProposal
ABSTRACT     FALSE
PROPERTIES   CipherAlgorithm
             HashAlgorithm
             PRFAlgorithm
             GroupId
             AuthenticationMethod
             MaxLifetimeSeconds
             MaxLifetimeKilobytes
             VendorID
```

7.2.1. The Property CipherAlgorithm

The property CipherAlgorithm specifies the proposed phase 1 security association encryption algorithm. The property is defined as follows:

```
NAME         CipherAlgorithm
DESCRIPTION  Specifies the proposed encryption algorithm for the
             phase 1 security association.
SYNTAX       unsigned 16-bit integer
VALUE        Consult [IKE] for valid values.
```

7.2.2. The Property HashAlgorithm

The property HashAlgorithm specifies the proposed phase 1 security association hash algorithm. The property is defined as follows:

NAME	HashAlgorithm
DESCRIPTION	Specifies the proposed hash algorithm for the phase 1 security association.
SYNTAX	unsigned 16-bit integer
VALUE	Consult [IKE] for valid values.

7.2.3. The Property PRFAlgorithm

The property PRFAlgorithm specifies the proposed phase 1 security association pseudo-random function. The property is defined as follows:

NAME	PRFAlgorithm
DESCRIPTION	Specifies the proposed pseudo-random function for the phase 1 security association.
SYNTAX	unsigned 16-bit integer
VALUE	Currently none defined in [IKE], if [IKE, DOI] are extended, then the values of [IKE, DOI] are to be used for values of PRFAlgorithm.

7.2.4. The Property GroupId

The property GroupId specifies the proposed phase 1 security association key exchange group. This property is ignored for all aggressive mode exchanges. If the GroupID number is from the vendor-specific range (32768-65535), the property VendorID qualifies the group number. The property is defined as follows:

NAME	GroupId
DESCRIPTION	Specifies the proposed key exchange group for the phase 1 security association.
SYNTAX	unsigned 16-bit integer
VALUE	Consult [IKE] for valid values.

Note: The value of this property is to be ignored in aggressive mode.

7.2.5. The Property AuthenticationMethod

The property AuthenticationMethod specifies the proposed phase 1 authentication method. The property is defined as follows:

NAME	AuthenticationMethod
DESCRIPTION	Specifies the proposed authentication method for the phase 1 security association.
SYNTAX	unsigned 16-bit integer
VALUE	0 - a special value that indicates that this particular proposal should be repeated once for each authentication method that corresponds to the credentials installed on the machine. For example, if the system has a pre-shared key and a certificate, a proposal list could be constructed that includes a proposal that specifies a pre-shared key and proposals for any of the public-key authentication methods. Consult [IKE] for valid values.

7.2.6. The Property MaxLifetimeSeconds

The property MaxLifetimeSeconds specifies the proposed maximum time, in seconds, that a security association will remain valid after its creation. The property is defined as follows:

NAME	MaxLifetimeSeconds
DESCRIPTION	Specifies the proposed maximum time that a security association will remain valid.
SYNTAX	unsigned 64-bit integer
VALUE	A value of zero indicates that the default of 8 hours be used. A non-zero value indicates the maximum seconds lifetime.

Note: While IKE can negotiate the lifetime as an arbitrary length field, the authors have assumed that a 64-bit integer will be sufficient.

7.2.7. The Property MaxLifetimeKilobytes

The property MaxLifetimeKilobytes specifies the proposed maximum kilobyte lifetime that a security association will remain valid after its creation. The property is defined as follows:

NAME	MaxLifetimeKilobytes
DESCRIPTION	Specifies the proposed maximum kilobyte lifetime that a security association will remain valid.
SYNTAX	unsigned 64-bit integer

VALUE A value of zero indicates that there should be no maximum kilobyte lifetime. A non-zero value specifies the desired kilobyte lifetime.

Note: While IKE can negotiate the lifetime as an arbitrary length field, the authors have assumed that a 64-bit integer will be sufficient.

7.2.8. The Property VendorID

The property VendorID further qualifies the key exchange group. The property is ignored unless the exchange is not in aggressive mode and the property GroupID is in the vendor-specific range. The property is defined as follows:

NAME	VendorID
DESCRIPTION	Specifies the Vendor ID to further qualify the key exchange group.
SYNTAX	string

7.3. The Class IPsecProposal

The class IPsecProposal adds no new properties, but inherits proposal properties from SAProposal, as well as aggregating the security association transforms necessary for building an IPsec proposal (see the aggregation class ContainedTransform). The class definition for IPsecProposal is as follows:

NAME	IPsecProposal
DESCRIPTION	Specifies the proposal parameters for IPsec security association negotiation.
DERIVED FROM	SAProposal
ABSTRACT	FALSE

7.4. The Abstract Class SATransform

The abstract class SATransform serves as the base class for the IPsec transforms that can be used to compose an IPsec proposal or to be used as a pre-configured action. The class definition for SATransform is as follows:

NAME	SATransform
DESCRIPTION	Base class for the different IPsec transforms.
ABSTRACT	TRUE
PROPERTIES	CommonName (from Policy) VendorID MaxLifetimeSeconds MaxLifetimeKilobytes

7.4.1. The Property CommonName

The property CommonName is inherited from Policy [PCIM] and specifies a user-friendly name for the SATransform. The property is defined as follows:

NAME	CommonName
DESCRIPTION	Specifies a user-friendly name for this Policy-related object.
SYNTAX	string

7.4.2. The Property VendorID

The property VendorID specifies the vendor ID for vendor-defined transforms. The property is defined as follows:

NAME	VendorID
DESCRIPTION	Specifies the vendor ID for vendor-defined transforms.
SYNTAX	string
VALUE	An empty VendorID string indicates that the transform is a standard one.

7.4.3. The Property MaxLifetimeSeconds

The property MaxLifetimeSeconds specifies the proposed maximum time, in seconds, that a security association will remain valid after its creation. The property is defined as follows:

NAME	MaxLifetimeSeconds
DESCRIPTION	Specifies the proposed maximum time that a security association will remain valid.
SYNTAX	unsigned 64-bit integer
VALUE	A value of zero indicates that the default of 8 hours be used. A non-zero value indicates the maximum seconds lifetime.

Note: While IKE can negotiate the lifetime as an arbitrary length field, the authors have assumed that a 64-bit integer will be sufficient.

7.4.4. The Property MaxLifetimeKilobytes

The property MaxLifetimeKilobytes specifies the proposed maximum kilobyte lifetime that a security association will remain valid after its creation. The property is defined as follows:

```
NAME          MaxLifetimeKilobytes
DESCRIPTION   Specifies the proposed maximum kilobyte lifetime
              that a security association will remain valid.
SYNTAX        unsigned 64-bit integer
VALUE         A value of zero indicates that there should be no
              maximum kilobyte lifetime.  A non-zero value
              specifies the desired kilobyte lifetime.
```

Note: While IKE can negotiate the lifetime as an arbitrary length field, the authors have assumed that a 64-bit integer will be sufficient.

7.5. The Class AHTransform

The class AHTransform specifies the AH algorithm to propose during IPsec security association negotiation. The class definition for AHTransform is as follows:

```
NAME          AHTransform
DESCRIPTION   Specifies the proposed AH algorithm.
ABSTRACT      FALSE
PROPERTIES    AHTransformId
              UseReplayPrevention
              ReplayPreventionWindowSize
```

7.5.1. The Property AHTransformId

The property AHTransformId specifies the transform ID of the AH algorithm. The property is defined as follows:

```
NAME          AHTransformId
DESCRIPTION   Specifies the transform ID of the AH algorithm.
SYNTAX        unsigned 16-bit integer
VALUE         Consult [DOI] for valid values.
```

7.5.2. The Property UseReplayPrevention

The property UseReplayPrevention specifies whether replay prevention detection is to be used. The property is defined as follows:

```
NAME          UseReplayPrevention
DESCRIPTION   Specifies whether to enable replay prevention
              detection.
SYNTAX        boolean
VALUE         true - replay prevention detection is enabled.
              false - replay prevention detection is disabled.
```

7.5.3. The Property ReplayPreventionWindowSize

The property ReplayPreventionWindowSize specifies, in bits, the length of the sliding window used by the replay prevention detection mechanism. The value of this property is meaningless if UseReplayPrevention is false. It is assumed that the window size will be power of 2. The property is defined as follows:

```
NAME         ReplayPreventionWindowSize
DESCRIPTION  Specifies the length of the window used by the replay
             prevention detection mechanism.
SYNTAX       unsigned 32-bit integer
```

7.6. The Class ESPTransform

The class ESPTransform specifies the ESP algorithms to propose during IPsec security association negotiation. The class definition for ESPTransform is as follows:

```
NAME         ESPTransform
DESCRIPTION  Specifies the proposed ESP algorithms.
ABSTRACT     FALSE
PROPERTIES   IntegrityTransformId
             CipherTransformId
             CipherKeyLength
             CipherKeyRounds
             UseReplayPrevention
             ReplayPreventionWindowSize
```

7.6.1. The Property IntegrityTransformId

The property IntegrityTransformId specifies the transform ID of the ESP integrity algorithm. The property is defined as follows:

```
NAME         IntegrityTransformId
DESCRIPTION  Specifies the transform ID of the ESP integrity
             algorithm.
SYNTAX       unsigned 16-bit integer
VALUE        Consult [DOI] for valid values.
```

7.6.2. The Property CipherTransformId

The property CipherTransformId specifies the transform ID of the ESP encryption algorithm. The property is defined as follows:

NAME	CipherTransformId
DESCRIPTION	Specifies the transform ID of the ESP encryption algorithm.
SYNTAX	unsigned 16-bit integer
VALUE	Consult [DOI] for valid values.

7.6.3. The Property CipherKeyLength

The property CipherKeyLength specifies, in bits, the key length for the ESP encryption algorithm. For encryption algorithms that use a fixed-length keys, this value is ignored. The property is defined as follows:

NAME	CipherKeyLength
DESCRIPTION	Specifies the ESP encryption key length in bits.
SYNTAX	unsigned 16-bit integer

7.6.4. The Property CipherKeyRounds

The property CipherKeyRounds specifies the number of key rounds for the ESP encryption algorithm. For encryption algorithms that use fixed number of key rounds, this value is ignored. The property is defined as follows:

NAME	CipherKeyRounds
DESCRIPTION	Specifies the number of key rounds for the ESP encryption algorithm.
SYNTAX	unsigned 16-bit integer
VALUE	Currently, key rounds are not defined for any ESP encryption algorithms.

7.6.5. The Property UseReplayPrevention

The property UseReplayPrevention specifies whether replay prevention detection is to be used. The property is defined as follows:

NAME	UseReplayPrevention
DESCRIPTION	Specifies whether to enable replay prevention detection.
SYNTAX	boolean
VALUE	true - replay prevention detection is enabled. false - replay prevention detection is disabled.

7.6.6. The Property ReplayPreventionWindowSize

The property ReplayPreventionWindowSize specifies, in bits, the length of the sliding window used by the replay prevention detection mechanism. The value of this property is meaningless if UseReplayPrevention is false. It is assumed that the window size will be power of 2. The property is defined as follows:

NAME	ReplayPreventionWindowSize
DESCRIPTION	Specifies the length of the window used by the replay prevention detection mechanism.
SYNTAX	unsigned 32-bit integer

7.7. The Class IPCOMPTransform

The class IPCOMPTransform specifies the IP compression (IPCOMP) algorithm to propose during IPsec security association negotiation. The class definition for IPCOMPTransform is as follows:

NAME	IPCOMPTransform
DESCRIPTION	Specifies the proposed IPCOMP algorithm.
ABSTRACT	FALSE
PROPERTIES	Algorithm DictionarySize PrivateAlgorithm

7.7.1. The Property Algorithm

The property Algorithm specifies the transform ID of the IPCOMP compression algorithm. The property is defined as follows:

NAME	Algorithm
DESCRIPTION	Specifies the transform ID of the IPCOMP compression algorithm.
SYNTAX	unsigned 16-bit integer
VALUE	1 - OUI: a vendor specific algorithm is used and specified in the property PrivateAlgorithm. Consult [DOI] for other valid values.

7.7.2. The Property DictionarySize

The property DictionarySize specifies the log2 maximum size of the dictionary for the compression algorithm. For compression algorithms that have pre-defined dictionary sizes, this value is ignored. The property is defined as follows:

```
NAME         DictionarySize
DESCRIPTION  Specifies the log2 maximum size of the dictionary.
SYNTAX       unsigned 16-bit integer
```

7.7.3. The Property PrivateAlgorithm

The property PrivateAlgorithm specifies a private vendor-specific compression algorithm. This value is only used when the property Algorithm is 1 (OUI). The property is defined as follows:

```
NAME         PrivateAlgorithm
DESCRIPTION  Specifies a private vendor-specific compression
             algorithm.
SYNTAX       unsigned 32-bit integer
```

7.8. The Association Class SAProposalInSystem

The class SAProposalInSystem weakly associates SAProposals with a System. The class definition for SAProposalInSystem is as follows:

```
NAME         SAProposalInSystem
DESCRIPTION  Weakly associates SAProposals with a System.
DERIVED FROM PolicyInSystem (see [PCIM])
ABSTRACT     FALSE
PROPERTIES   Antecedent[ref System [1..1]]
             Dependent[ref SAProposal[0..n] [weak]]
```

7.8.1. The Reference Antecedent

The property Antecedent is inherited from the PolicyInSystem and is overridden to refer to a System instance. The [1..1] cardinality indicates that an SAProposal instance MUST be associated with one and only one System instance.

7.8.2. The Reference Dependent

The property Dependent is inherited from PolicyInSystem and is overridden to refer to an SAProposal instance. The [0..n] cardinality indicates that a System instance may be associated with zero or more SAProposal instances.

7.9. The Aggregation Class ContainedTransform

The class ContainedTransform associates an IPsecProposal with the set of SATransforms that make up the proposal. If multiple transforms of the same type are in a proposal, then they are to be logically ORed and the order of preference is dictated by the SequenceNumber property. Sets of transforms of different types are logically ANDed.

For example, if the ordered proposal list were

```
ESP = { (HMAC-MD5, 3DES), (HMAC-MD5, DES) }
AH  = { MD5, SHA-1 }
```

then the one sending the proposal would want the other side to pick one from the ESP transform (preferably (HMAC-MD5, 3DES)) list AND one from the AH transform list (preferably MD5).

The class definition for ContainedTransform is as follows:

```
NAME          ContainedTransform
DESCRIPTION   Associates an IPsecProposal with the set of
              SATransforms that make up the proposal.
DERIVED FROM  PolicyComponent (see [PCIM])
ABSTRACT      FALSE
PROPERTIES    GroupComponent[ref IPsecProposal[0..n]]
              PartComponent[ref SATransform[1..n]]
              SequenceNumber
```

7.9.1. The Reference GroupComponent

The property GroupComponent is inherited from PolicyComponent and is overridden to refer to an IPsecProposal instance. The [0..n] cardinality indicates that an SATransform instance may be associated with zero or more IPsecProposal instances.

7.9.2. The Reference PartComponent

The property PartComponent is inherited from PolicyComponent and is overridden to refer to an SATransform instance. The [1..n] cardinality indicates that an IPsecProposal instance MUST be associated with at least one SATransform instance.

7.9.3. The Property SequenceNumber

The property SequenceNumber specifies the order of preference for the SATransforms of the same type. The property is defined as follows:

```
NAME          SequenceNumber
DESCRIPTION   Specifies the preference order for the SATransforms
              of the same type.
SYNTAX        unsigned 16-bit integer
VALUE         Lower-valued transforms are preferred over transforms
              of the same type with higher values. For
              ContainedTransforms that reference the same
              IPsecProposal, SequenceNumber values must be unique.
```

7.10. The Association Class SATransformInSystem

The class SATransformInSystem weakly associates SATransforms with a System. The class definition for SATransformInSystem System is as follows:

```
NAME          SATransformInSystem
DESCRIPTION   Weakly associates SATransforms with a System.
DERIVED FROM  PolicyInSystem (see [PCIM])
ABSTRACT      FALSE
PROPERTIES    Antecedent[ref System[1..1]]
              Dependent[ref SATransform[0..n] [weak]]
```

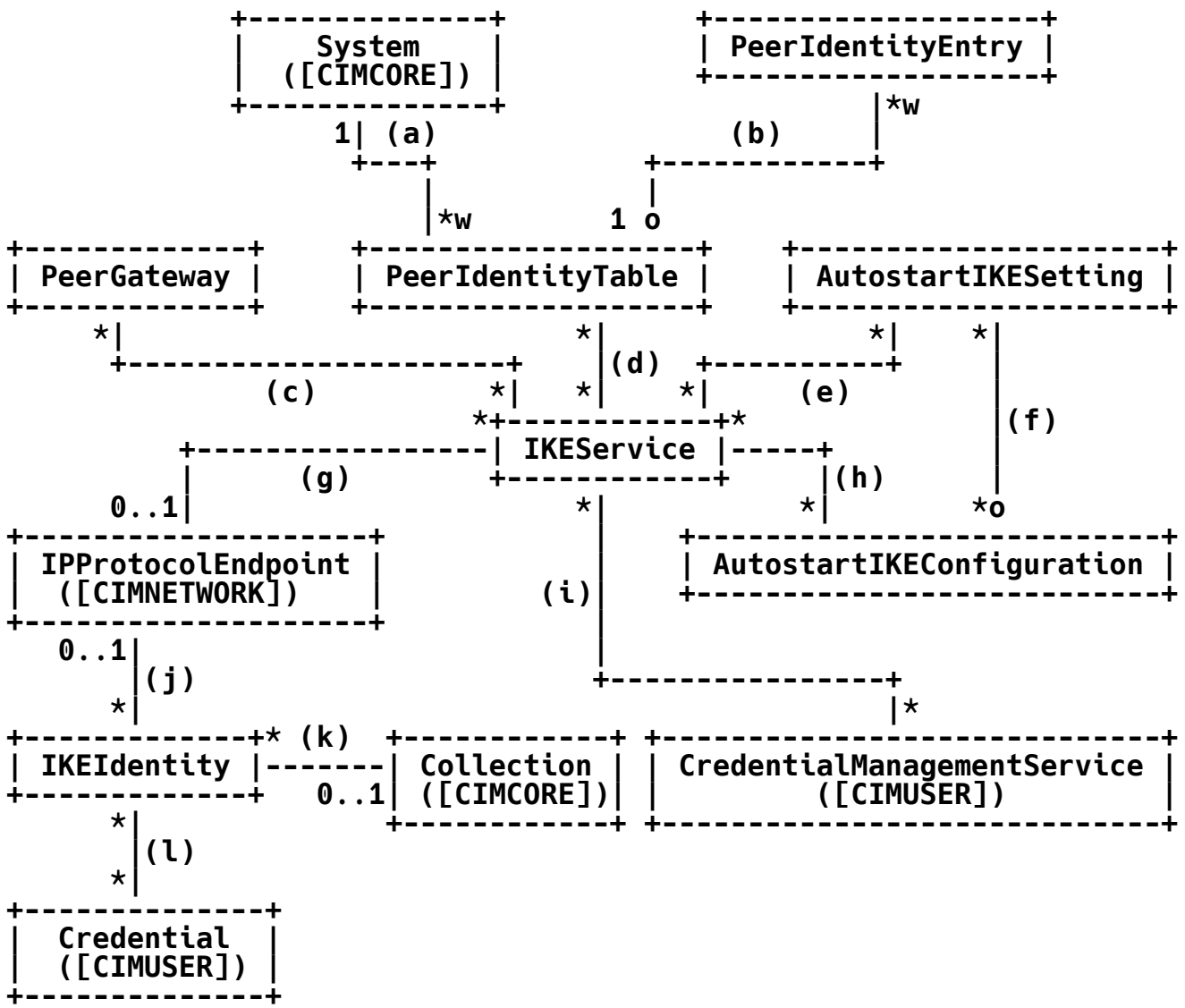
7.10.1. The Reference Antecedent

The property Antecedent is inherited from PolicyInSystem and is overridden to refer to a System instance. The [1..1] cardinality indicates that an SATransform instance MUST be associated with one and only one System instance.

7.10.2. The Reference Dependent

The property Dependent is inherited from PolicyInSystem and is overridden to refer to an SATransform instance. The [0..n] cardinality indicates that a System instance may be associated with zero or more SATransform instances.

8. IKE Service and Identity Classes



(a) HostedPeerIdentityTable
(b) PeerIdentityMember
(c) IKEServicePeerGateway
(d) IKEServicePeerIdentityTable
(e) IKEAutostartSetting
(f) AutostartIKESettingContext
(g) IKEServiceForEndpoint
(h) IKEAutostartConfiguration
(i) IKEUsesCredentialManagementService
(j) EndpointHasLocalIKEIdentity

(k) CollectionHasLocalIKEIdentity
(l) IKEIdentitysCredential

This portion of the model contains additional information that is useful in applying the policy. The IKEService class MAY be used to represent the IKE negotiation function in a system. The IKEService uses the various tables that contain information about IKE peers as well as the configuration for specifying security associations that are started automatically. The information in the PeerGateway, PeerIdentityTable and related classes is necessary to completely specify the policies.

An interface (represented by an IPProtocolEndpoint) has an IKEService that provides the negotiation services for that interface. That service MAY also have a list of security associations automatically started at the time the IKE service is initialized.

The IKEService also has a set of identities that it may use in negotiations with its peers. Those identities are associated with the interfaces (or collections of interfaces).

8.1. The Class IKEService

The class IKEService represents the IKE negotiation function. An instance of this service may provide that negotiation service for one or more interfaces (represented by the IPProtocolEndpoint class) of a System. There may be multiple instances of IKE services on a System but only one per interface. The class definition for IKEService is as follows:

NAME	IKEService
DESCRIPTION	IKEService is used to represent the IKE negotiation function.
DERIVED FROM	Service (see [CIMCORE])
ABSTRACT	FALSE

8.2. The Class PeerIdentityTable

The class PeerIdentityTable aggregates the table entries that provide mappings between identities and their addresses. The class definition for PeerIdentityTable is as follows:

NAME	PeerIdentityTable
DESCRIPTION	PeerIdentityTable aggregates PeerIdentityEntry instances to provide a table of identity-address mappings.
DERIVED FROM	Collection (see [CIMCORE])

```
ABSTRACT     FALSE
PROPERTIES   Name
```

8.2.1. The Property Name

The property Name uniquely identifies the table. The property is defined as follows:

```
NAME         Name
DESCRIPTION  Name uniquely identifies the table.
SYNTAX       string
```

8.3. The Class PeerIdentityEntry

The class PeerIdentityEntry specifies the mapping between peer identity and their IP address. The class definition for PeerIdentityEntry is as follows:

```
NAME         PeerIdentityEntry
DESCRIPTION  PeerIdentityEntry provides a mapping between a peer's
             identity and address.
DERIVED_FROM LogicalElement (see [CIMCORE])
ABSTRACT     FALSE
PROPERTIES   PeerIdentity
             PeerIdentityType
             PeerAddress
             PeerAddressType
```

The pre-shared key to be used with this peer (if applicable) is contained in an instance of the class SharedSecret (see [CIMUSER]). The pre-shared key is stored in the property Secret, the property protocol contains "IKE", the property algorithm contains the algorithm used to protect the secret (can be "PLAINTEXT" if the IPsec entity has no secret storage), the value of property RemoteID must match the PeerIdentity property of the PeerIdentityEntry instance describing the IKE peer.

8.3.1. The Property PeerIdentity

The property PeerIdentity contains a string encoding of the Identity payload for the IKE peer. The property is defined as follows:

```
NAME         PeerIdentity
DESCRIPTION  The PeerIdentity is the ID payload of a peer.
SYNTAX       string
```

8.3.2. The Property PeerIdentityType

The property PeerIdentityType is an enumeration that specifies the type of the PeerIdentity. The property is defined as follows:

NAME	PeerIdentityType
DESCRIPTION	PeerIdentityType is the type of the ID payload of a peer.
SYNTAX	unsigned 16-bit integer
VALUE	The enumeration values are specified in [DOI] section 4.6.2.1.

8.3.3. The Property PeerAddress

The property PeerAddress specifies the string representation of the IP address of the peer formatted according to the appropriate convention as defined in the PeerAddressType property (e.g., dotted decimal notation). The property is defined as follows:

NAME	PeerAddress
DESCRIPTION	PeerAddress is the address of the peer with the ID payload.
SYNTAX	string
VALUE	String representation of an IPv4 or IPv6 address.

8.3.4. The Property PeerAddressType

The property PeerAddressType specifies the format of the PeerAddress property value. The property is defined as follows:

NAME	PeerAddressType
DESCRIPTION	PeerAddressType is the type of address in PeerAddress.
SYNTAX	unsigned 16-bit integer
VALUE	0 - Unknown 1 - IPv4 2 - IPv6

8.4. The Class AutostartIKEConfiguration

The class AutostartIKEConfiguration groups AutostartIKESetting instances into configuration sets. When applied, the settings cause an IKE service to automatically start (negotiate or statically set as appropriate) the Security Associations. The class definition for AutostartIKEConfiguration is as follows:

```
NAME         AutostartIKEConfiguration
DESCRIPTION  A configuration set of AutostartIKESetting instances
             to be automatically started by the IKE service.
DERIVED FROM SystemConfiguration (see [CIMCORE])
ABSTRACT     FALSE
```

8.5. The Class AutostartIKESetting

The class AutostartIKESetting is used to automatically initiate IKE negotiations with peers (or statically create an SA) as specified in the AutostartIKESetting properties. Appropriate actions are initiated according to the policy that matches the setting parameters. The class definition for AutostartIKESetting is as follows:

```
NAME         AutostartIKESetting
DESCRIPTION  AutostartIKESetting is used to automatically initiate
             IKE negotiations with peers or statically create an
             SA.
DERIVED FROM SystemSetting (see [CIMCORE])
ABSTRACT     FALSE
PROPERTIES   Phase1Only
             AddressType
             SourceAddress
             SourcePort
             DestinationAddress
             DestinationPort
             Protocol
```

8.5.1. The Property Phase1Only

The property Phase1Only is used to limit the IKE negotiation to a phase 1 SA establishment only. When set to False, both phase 1 and phase 2 SAs are negotiated. The property is defined as follows:

```
NAME         Phase1Only
DESCRIPTION  Used to indicate whether a phase 1 only or both phase
             1 and phase 2 security associations should attempt
             establishment.
SYNTAX       boolean
VALUE        true - attempt to establish a phase 1 security
             association
             false - attempt to establish phase 1 and phase 2
             security associations
```

8.5.2. The Property AddressType

The property AddressType specifies a type of the addresses in the SourceAddress and DestinationAddress properties. The property is defined as follows:

```
NAME         AddressType
DESCRIPTION  AddressType is the type of address in SourceAddress
             and DestinationAddress properties.
SYNTAX       unsigned 16-bit integer
VALUE        0 - Unknown
             1 - IPv4
             2 - IPv6
```

8.5.3. The Property SourceAddress

The property SourceAddress specifies the dotted-decimal or colon-decimal formatted IP address used as the source address in comparing with policy filter entries and used in any phase 2 negotiations. The property is defined as follows:

```
NAME         SourceAddress
DESCRIPTION  The source address to compare with the filters to
             determine the appropriate policy rule.
SYNTAX       string
VALUE        dotted-decimal or colon-decimal formatted IP address
```

8.5.4. The Property SourcePort

The property SourcePort specifies the port number used as the source port in comparing policy filter entries and is used in any phase 2 negotiations. The property is defined as follows:

```
NAME         SourcePort
DESCRIPTION  The source port to compare with the filters to
             determine the appropriate policy rule.
SYNTAX       unsigned 16-bit integer
```

8.5.5. The Property DestinationAddress

The property DestinationAddress specifies the dotted-decimal or colon-decimal formatted IP address used as the destination address in comparing policy filter entries and is used in any phase 2 negotiations. The property is defined as follows:

```
NAME         DestinationAddress
DESCRIPTION  The destination address to compare with the filters
             to determine the appropriate policy rule.
```

```
SYNTAX       string
VALUE        dotted-decimal or colon-decimal formatted IP address
```

8.5.6. The Property DestinationPort

The property DestinationPort specifies the port number used as the destination port in comparing policy filter entries and is used in any phase 2 negotiations. The property is defined as follows:

```
NAME         DestinationPort
DESCRIPTION  The destination port to compare with the filters to
             determine the appropriate policy rule.
SYNTAX       unsigned 16-bit integer
```

8.5.7. The Property Protocol

The property Protocol specifies the protocol number used in comparing with policy filter entries and is used in any phase 2 negotiations. The property is defined as follows:

```
NAME         Protocol
DESCRIPTION  The protocol number used in comparing policy
             filter entries.
SYNTAX       unsigned 8-bit integer
```

8.6. The Class IKEIdentity

The class IKEIdentity is used to represent the identities that may be used for an IPProtocolEndpoint (or collection of IPProtocolEndpoints) to identify the IKE Service in IKE phase 1 negotiations. The policy IKEAction.UseIKEIdentityType specifies which type of the available identities to use in a negotiation exchange and the IKERule.IdentityContexts specifies the match values to be used, along with the local address, in selecting the appropriate identity for a negotiation. The ElementID property value (defined in the parent class, UsersAccess) should be that of either the IPProtocolEndpoint or Collection of endpoints as appropriate. The class definition for IKEIdentity is as follows:

```
NAME         IKEIdentity
DESCRIPTION  IKEIdentity is used to represent the identities that
             may be used for an IPProtocolEndpoint (or collection
             of IPProtocolEndpoints) to identify the IKE Service
             in IKE phase 1 negotiations.
DERIVED FROM UsersAccess (see [CIMUSER])
ABSTRACT     FALSE
```

```
PROPERTIES   IdentityType
             IdentityValue
             IdentityContexts
```

8.6.1. The Property IdentityType

The property IdentityType is an enumeration that specifies the type of the IdentityValue. The property is defined as follows:

```
NAME         IdentityType
DESCRIPTION  IdentityType is the type of the IdentityValue.
SYNTAX       unsigned 16-bit integer
VALUE        The enumeration values are specified in [DOI] section
             4.6.2.1.
```

8.6.2. The Property IdentityValue

The property IdentityValue contains a string encoding of the Identity payload. For IKEIdentity instances that are address types (i.e., IPv4 or IPv6 addresses), the IdentityValue string value MAY be omitted; then the associated IPProtocolEndpoint (or appropriate member of the Collection of endpoints) is used as the identity value. The property is defined as follows:

```
NAME         IdentityValue
DESCRIPTION  IdentityValue contains a string encoding of the
             Identity payload.
SYNTAX       string
```

8.6.3. The Property IdentityContexts

The IdentityContexts property is used to constrain the use of IKEIdentity instances to match that specified in the IKERule.IdentityContexts. The IdentityContexts are formatted as policy roles and role combinations [PCIM] & [PCIME]. Each value represents one context or context combination. Since this is a multi-valued property, more than one context or combination of contexts can be associated with a single IKEIdentity. Each value is a string of the form:

```
<ContextName>[&&<ContextName>]*
```

where the individual context names appear in alphabetical order (according to the collating sequence for UCS-2). If one or more values in the IKERule.IdentityContexts array match one or more IKEIdentity.IdentityContexts, then the identity's context matches. (That is, each value of the IdentityContext array is an ORed condition.) In combination with the address of the

IPProtocolEndpoint and IKEAction.UseIKEIdentityType, there SHOULD be exactly one IKEIdentity. The property is defined as follows:

NAME	IdentityContexts
DESCRIPTION	The IKE service of a security endpoint may have multiple identities for use in different situations. The combination of the interface (represented by the IPProtocolEndpoint), the identity type (as specified in the IKEAction) and the IdentityContexts selects a unique identity.
SYNTAX	string array
VALUE	string of the form <ContextName>[&&<ContextName>]*

8.7. The Association Class HostedPeerIdentityTable

The class HostedPeerIdentityTable provides the name scoping relationship for PeerIdentityTable entries in a System. The PeerIdentityTable is weak to the System. The class definition for HostedPeerIdentityTable is as follows:

NAME	HostedPeerIdentityTable
DESCRIPTION	The PeerIdentityTable instances are weak (name scoped by) the owning System.
DERIVED FROM	Dependency (see [CIMCORE])
ABSTRACT	FALSE
PROPERTIES	Antecedent [ref System[1..1]] Dependent [ref PeerIdentityTable[0..n] [weak]]

8.7.1. The Reference Antecedent

The property Antecedent is inherited from Dependency and is overridden to refer to a System instance. The [1..1] cardinality indicates that a PeerIdentityTable instance MUST be associated in a weak relationship with one and only one System instance.

8.7.2. The Reference Dependent

The property Dependent is inherited from Dependency and is overridden to refer to a PeerIdentityTable instance. The [0..n] cardinality indicates that a System instance may be associated with zero or more PeerIdentityTable instances.

8.8. The Aggregation Class PeerIdentityMember

The class PeerIdentityMember aggregates PeerIdentityEntry instances into a PeerIdentityTable. This is a weak aggregation. The class definition for PeerIdentityMember is as follows:

```
NAME         PeerIdentityMember
DESCRIPTION  PeerIdentityMember aggregates PeerIdentityEntry
             instances into a PeerIdentityTable.
DERIVED FROM MemberOfCollection (see [CIMCORE])
ABSTRACT     FALSE
PROPERTIES   Collection [ref PeerIdentityTable[1..1]]
             Member [ref PeerIdentityEntry [0..n] [weak]]
```

8.8.1. The Reference Collection

The property Collection is inherited from MemberOfCollection and is overridden to refer to a PeerIdentityTable instance. The [1..1] cardinality indicates that a PeerIdentityEntry instance MUST be associated with one and only one PeerIdentityTable instance (i.e., PeerIdentityEntry instances are not shared across PeerIdentityTables).

8.8.2. The Reference Member

The property Member is inherited from MemberOfCollection and is overridden to refer to a PeerIdentityEntry instance. The [0..n] cardinality indicates that a PeerIdentityTable instance may be associated with zero or more PeerIdentityEntry instances.

8.9. The Association Class IKEServicePeerGateway

The class IKEServicePeerGateway provides the association between an IKEService and the list of PeerGateway instances that it uses in negotiating with security gateways. The class definition for IKEServicePeerGateway is as follows:

```
NAME         IKEServicePeerGateway
DESCRIPTION  Associates an IKEService and the list of PeerGateway
             instances that it uses in negotiating with security
             gateways.
DERIVED FROM Dependency (see [CIMCORE])
ABSTRACT     FALSE
PROPERTIES   Antecedent [ref PeerGateway[0..n]]
             Dependent [ref IKEService[0..n]]
```

8.9.1. The Reference Antecedent

The property Antecedent is inherited from Dependency and is overridden to refer to a PeerGateway instance. The [0..n] cardinality indicates that an IKEService instance may be associated with zero or more PeerGateway instances.

8.9.2. The Reference Dependent

The property Dependent is inherited from Dependency and is overridden to refer to an IKEService instance. The [0..n] cardinality indicates that a PeerGateway instance may be associated with zero or more IKEService instances.

8.10. The Association Class IKEServicePeerIdentityTable

The class IKEServicePeerIdentityTable provides the relationship between an IKEService and a PeerIdentityTable that it uses to map between addresses and identities as required. The class definition for IKEServicePeerIdentityTable is as follows:

```
NAME         IKEServicePeerIdentityTable
DESCRIPTION  IKEServicePeerIdentityTable provides the relationship
             between an IKEService and a PeerIdentityTable that it
             uses.
DERIVED FROM Dependency (see [CIMCORE])
ABSTRACT     FALSE
PROPERTIES   Antecedent [ref PeerIdentityTable[0..n]]
             Dependent [ref IKEService[0..n]]
```

8.10.1. The Reference Antecedent

The property Antecedent is inherited from Dependency and is overridden to refer to a PeerIdentityTable instance. The [0..n] cardinality indicates that an IKEService instance may be associated with zero or more PeerIdentityTable instances.

8.10.2. The Reference Dependent

The property Dependent is inherited from Dependency and is overridden to refer to an IKEService instance. The [0..n] cardinality indicates that a PeerIdentityTable instance may be associated with zero or more IKEService instances.

8.11. The Association Class IKEAutostartSetting

The class IKEAutostartSetting associates an AutostartIKESetting with an IKEService that may use it to automatically start an IKE negotiation or create a static SA. The class definition for IKEAutostartSetting is as follows:

```
NAME         IKEAutostartSetting
DESCRIPTION  Associates a AutostartIKESetting with an IKEService.
DERIVED FROM ElementSetting (see [CIMCORE])
ABSTRACT     FALSE
```

```
PROPERTIES   Element [ref IKEService[0..n]]
             Setting [ref AutostartIKESetting[0..n]]
```

8.11.1. The Reference Element

The property Element is inherited from ElementSetting and is overridden to refer to an IKEService instance. The [0..n] cardinality indicates an AutostartIKESetting instance may be associated with zero or more IKEService instances.

8.11.2. The Reference Setting

The property Setting is inherited from ElementSetting and is overridden to refer to an AutostartIKESetting instance. The [0..n] cardinality indicates that an IKEService instance may be associated with zero or more AutostartIKESetting instances.

8.12. The Aggregation Class AutostartIKESettingContext

The class AutostartIKESettingContext aggregates the settings used to automatically start negotiations or create a static SA into a configuration set. The class definition for AutostartIKESettingContext is as follows:

```
NAME         AutostartIKESettingContext
DESCRIPTION  AutostartIKESettingContext aggregates the
             AutostartIKESetting instances into a configuration
             set.
DERIVED FROM SystemSettingContext (see [CIMCORE])
ABSTRACT     FALSE
PROPERTIES   Context [ref AutostartIKEConfiguration [0..n]]
             Setting [ref AutostartIKESetting [0..n]]
             SequenceNumber
```

8.12.1. The Reference Context

The property Context is inherited from SystemSettingContext and is overridden to refer to an AutostartIKEConfiguration instance. The [0..n] cardinality indicates that an AutostartIKESetting instance may be associated with zero or more AutostartIKEConfiguration instances (i.e., a setting may be in multiple configuration sets).

8.12.2. The Reference Setting

The property Setting is inherited from SystemSettingContext and is overridden to refer to an AutostartIKESetting instance. The [0..n] cardinality indicates that an AutostartIKEConfiguration instance may be associated with zero or more AutostartIKESetting instances.

8.12.3. The Property SequenceNumber

The property SequenceNumber specifies the ordering to be used when starting negotiations or creating a static SA. A zero value indicates that order is not significant and settings may be applied in parallel with other settings. All other settings in the configuration are executed in sequence from lower to higher values. Sequence numbers need not be unique in an AutostartIKEConfiguration and order is not significant for settings with the same sequence number. The property is defined as follows:

```
NAME         SequenceNumber
DESCRIPTION  The sequence in which the settings are applied
             within a configuration set.
SYNTAX       unsigned 16-bit integer
```

8.13. The Association Class IKEServiceForEndpoint

The class IKEServiceForEndpoint provides the association showing which IKE service, if any, provides IKE negotiation services for which network interfaces. The class definition for IKEServiceForEndpoint is as follows:

```
NAME         IKEServiceForEndpoint
DESCRIPTION  Associates an IPProtocolEndpoint with an IKEService
             that provides negotiation services for the endpoint.
DERIVED FROM Dependency (see [CIMCORE])
ABSTRACT     FALSE
PROPERTIES   Antecedent [ref IKEService[0..1]]
             Dependent [ref IPProtocolEndpoint[0..n]]
```

8.13.1. The Reference Antecedent

The property Antecedent is inherited from Dependency and is overridden to refer to an IKEService instance. The [0..1] cardinality indicates that an IPProtocolEndpoint instance MUST by associated with at most one IKEService instance.

8.13.2. The Reference Dependent

The property Dependent is inherited from Dependency and is overridden to refer to an IPProtocolEndpoint that is associated with at most one IKEService. The [0..n] cardinality indicates an IKEService instance may be associated with zero or more IPProtocolEndpoint instances.

8.14. The Association Class IKEAutostartConfiguration

The class IKEAutostartConfiguration provides the relationship between an IKEService and a configuration set that it uses to automatically start a set of SAs. The class definition for IKEAutostartConfiguration is as follows:

NAME	IKEAutostartConfiguration
DESCRIPTION	IKEAutostartConfiguration provides the relationship between an IKEService and an AutostartIKEConfiguration that it uses to automatically start a set of SAs.
DERIVED FROM	Dependency (see [CIMCORE])
ABSTRACT	FALSE
PROPERTIES	Antecedent [ref AutostartIKEConfiguration [0..n]] Dependent [ref IKEService [0..n]] Active

8.14.1. The Reference Antecedent

The property Antecedent is inherited from Dependency and is overridden to refer to an AutostartIKEConfiguration instance. The [0..n] cardinality indicates that an IKEService instance may be associated with zero or more AutostartIKEConfiguration instances.

8.14.2. The Reference Dependent

The property Dependent is inherited from Dependency and is overridden to refer to an IKEService instance. The [0..n] cardinality indicates that an AutostartIKEConfiguration instance may be associated with zero or more IKEService instances.

8.14.3. The Property Active

The property Active indicates whether the AutostartIKEConfiguration set is currently active for the associated IKEService. That is, at boot time, the active configuration is used to automatically start IKE negotiations and create static SAs. The property is defined as follows:

NAME	Active
DESCRIPTION	Active indicates whether the AutostartIKEConfiguration set is currently active for the associated IKEService.
SYNTAX	boolean

VALUE	true - AutostartIKEConfiguration is currently active for associated IKEService. false - AutostartIKEConfiguration is currently inactive for associated IKEService.

8.15. The Association Class IKEUsesCredentialManagementService

The class IKEUsesCredentialManagementService defines the set of CredentialManagementService(s) that are trusted sources of credentials for IKE phase 1 negotiations. The class definition for IKEUsesCredentialManagementService is as follows:

NAME	IKEUsesCredentialManagementService
DESCRIPTION	Associates the set of CredentialManagementService(s) that are trusted by the IKEService as sources of credentials used in IKE phase 1 negotiations.
DERIVED FROM	Dependency (see [CIMCORE])
ABSTRACT	FALSE
PROPERTIES	Antecedent [ref CredentialManagementService [0..n]] Dependent [ref IKEService [0..n]]

8.15.1. The Reference Antecedent

The property Antecedent is inherited from Dependency and is overridden to refer to a CredentialManagementService instance. The [0..n] cardinality indicates that an IKEService instance may be associated with zero or more CredentialManagementService instances.

8.15.2. The Reference Dependent

The property Dependent is inherited from Dependency and is overridden to refer to an IKEService instance. The [0..n] cardinality indicates that a CredentialManagementService instance may be associated with zero or more IKEService instances.

8.16. The Association Class EndpointHasLocalIKEIdentity

The class EndpointHasLocalIKEIdentity associates an IPProtocolEndpoint with a set of IKEIdentity instances that may be used in negotiating security associations on the endpoint. An IKEIdentity MUST be associated with either an IPProtocolEndpoint using this association or with a collection of IKEIdentity instances using the CollectionHasLocalIKEIdentity association. The class definition for EndpointHasLocalIKEIdentity is as follows:

```
NAME          EndpointHasLocalIKEIdentity
DESCRIPTION   EndpointHasLocalIKEIdentity associates an
              IPProtocolEndpoint with a set of IKEIdentity
              instances.
DERIVED FROM  ElementAsUser (see [CIMUSER])
ABSTRACT      FALSE
PROPERTIES    Antecedent [ref IPProtocolEndpoint [0..1]]
              Dependent [ref IKEIdentity [0..n]]
```

8.16.1. The Reference Antecedent

The property Antecedent is inherited from ElementAsUser and is overridden to refer to an IPProtocolEndpoint instance. The [0..1] cardinality indicates that an IKEIdentity instance MUST be associated with at most one IPProtocolEndpoint instance.

8.16.2. The Reference Dependent

The property Dependent is inherited from ElementAsUser and is overridden to refer to an IKEIdentity instance. The [0..n] cardinality indicates that an IPProtocolEndpoint instance may be associated with zero or more IKEIdentity instances.

8.17. The Association Class CollectionHasLocalIKEIdentity

The class CollectionHasLocalIKEIdentity associates a Collection of IPProtocolEndpoint instances with a set of IKEIdentity instances that may be used in negotiating SAs for endpoints in the collection. An IKEIdentity MUST be associated with either an IPProtocolEndpoint using the EndpointHasLocalIKEIdentity association or with a collection of IKEIdentity instances using this association. The class definition for CollectionHasLocalIKEIdentity is as follows:

```
NAME          CollectionHasLocalIKEIdentity
DESCRIPTION   CollectionHasLocalIKEIdentity associates a collection
              of IPProtocolEndpoint instances with a set of
              IKEIdentity instances.
DERIVED FROM  ElementAsUser (see [CIMUSER])
ABSTRACT      FALSE
PROPERTIES    Antecedent [ref Collection [0..1]]
              Dependent [ref IKEIdentity [0..n]]
```

8.17.1. The Reference Antecedent

The property Antecedent is inherited from ElementAsUser and is overridden to refer to a Collection instance. The [0..1] cardinality indicates that an IKEIdentity instance MUST be associated with at most one Collection instance.

8.17.2. The Reference Dependent

The property Dependent is inherited from ElementAsUser and is overridden to refer to an IKEIdentity instance. The [0..n] cardinality indicates that a Collection instance may be associated with zero or more IKEIdentity instances.

8.18. The Association Class IKEIdentitysCredential

The class IKEIdentitysCredential is an association that relates a set of credentials to their corresponding local IKE Identities. The class definition for IKEIdentitysCredential is as follows:

```
NAME         IKEIdentitysCredential
DESCRIPTION  IKEIdentitysCredential associates a set of
             credentials to their corresponding local IKEIdentity.
DERIVED FROM UsersCredential (see [CIMCORE])
ABSTRACT     FALSE
PROPERTIES   Antecedent [ref Credential [0..n]]
             Dependent [ref IKEIdentity [0..n]]
```

8.18.1. The Reference Antecedent

The property Antecedent is inherited from UsersCredential and is overridden to refer to a Credential instance. The [0..n] cardinality indicates that the IKEIdentity instance may be associated with zero or more Credential instances.

8.18.2. The Reference Dependent

The property Dependent is inherited from UsersCredential and is overridden to refer to an IKEIdentity instance. The [0..n] cardinality indicates that a Credential instance may be associated with zero or more IKEIdentity instances.

9. Implementation Requirements

The following table specifies which classes, properties, associations and aggregations MUST or SHOULD or MAY be implemented.

10. Security Considerations

This document only describes an information model for IPsec policy. It does not detail security requirements for storage or delivery of said information.

Physical models derived from this information model MUST implement the relevant security for storage and delivery. Most of the classes (e.g., IpHeadersFilter, SAAction,...) MUST at least provided the integrity service; other pieces of information MUST also receive the confidentiality service (e.g., SharedSecret as described in the classes PeerIdentityEntry and PreconfiguredSAAction).

11. Intellectual Property Statement

The IETF takes no position regarding the validity or scope of any intellectual property or other rights that might be claimed to pertain to the implementation or use of the technology described in this document or the extent to which any license under such rights might or might not be available; neither does it represent that it has made any effort to identify any such rights. Information on the IETF's procedures with respect to rights in standards-track and standards-related documentation can be found in BCP-11.

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12. References

12.1. Normative References

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[CIMUSER] DMTF Common Information Model - User-Security Model v2.5 which can be found at http://www.dmtf.org/standards/CIM_Schema25/CIM_User25.mof

[CIMNETWORK] DMTF Common Information Model - Network Model v2.5 which can be found at http://www.dmtf.org/standards/CIM_Schema25/CIM_Network25.mof

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[DMTF] Distributed Management Task Force, http://www.dmtf.org/

13. Disclaimer

The views and specification herein are those of the authors and are not necessarily those of their employer. The authors and their employer specifically disclaim responsibility for any problems arising from correct or incorrect implementation or use of this specification.

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15. Authors' Addresses

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