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IPsec Configuration Policy Model

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Status of this Memo

Abstract

This document presents an object-oriented model of IPsec policy designed to:

- facilitate agreement about the content and semantics of IPsec policy
- 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 schema described in this document models the IKE phase one parameters as described in [IKE] and the IKE phase two parameters for the IPsec Domain of Interpretation as described in [COMP, ESP, AH, DOI]. It is based upon the core policy classes as defined in the Policy Core Information Model (PCIM) [PCIM] and on the Policy Core Information Model Extensions (PCIMe) [PCIME].

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1. Introduction

Internet Protocol security (IPsec) policy may assume a variety of forms as it travels from storage to distribution point to decision point. 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. The purpose of this document is to abstract IPsec policy into a task-independent representation that is not constrained by any particular task-dependent representation.

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 describes the class 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. The reason behind this decision is that 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, can also be 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.
- Next to a line representing an association appears a cardinality. Cardinalities indicate the constraints on the number of object instances in a set of relationships. Every association instance has a single set of references. The cardinality indicates the number of instances that may refer to a given object instance. 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. Using an asterisk is shorthand for 0..n.
  - the letter n indicating from 1 to many. Using 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].

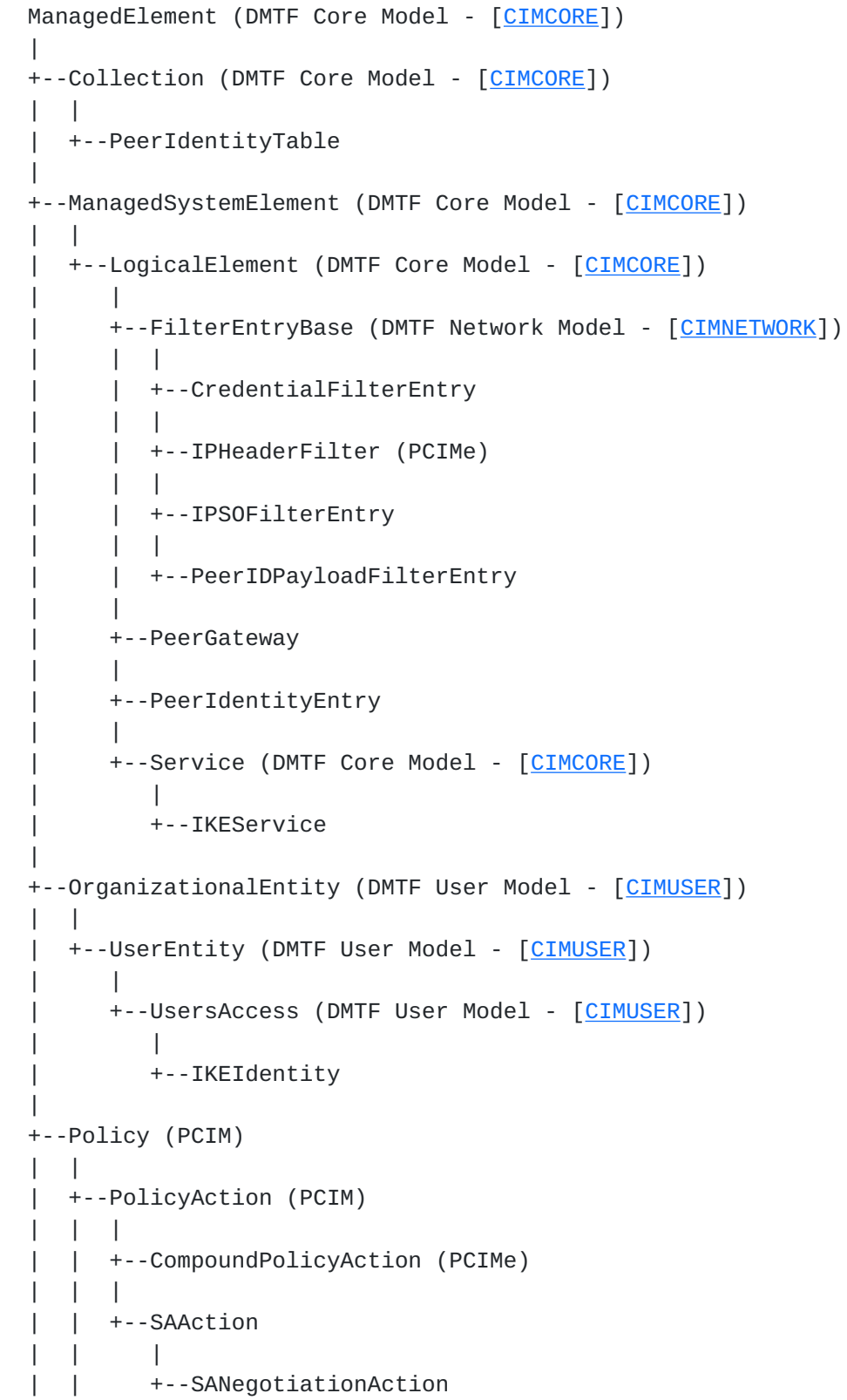
It should be noted that the UML static class diagram presented is a conceptual view of IPsec policy designed to aid in understanding. It does not necessarily get translated class for class into another representation. For example, an LDAP implementation may flatten out the representation to fewer classes (because of the inefficiency of following references).

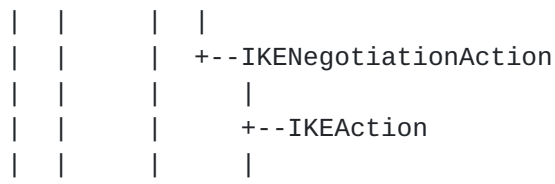
3. IPsec Policy Model Inheritance Hierarchy

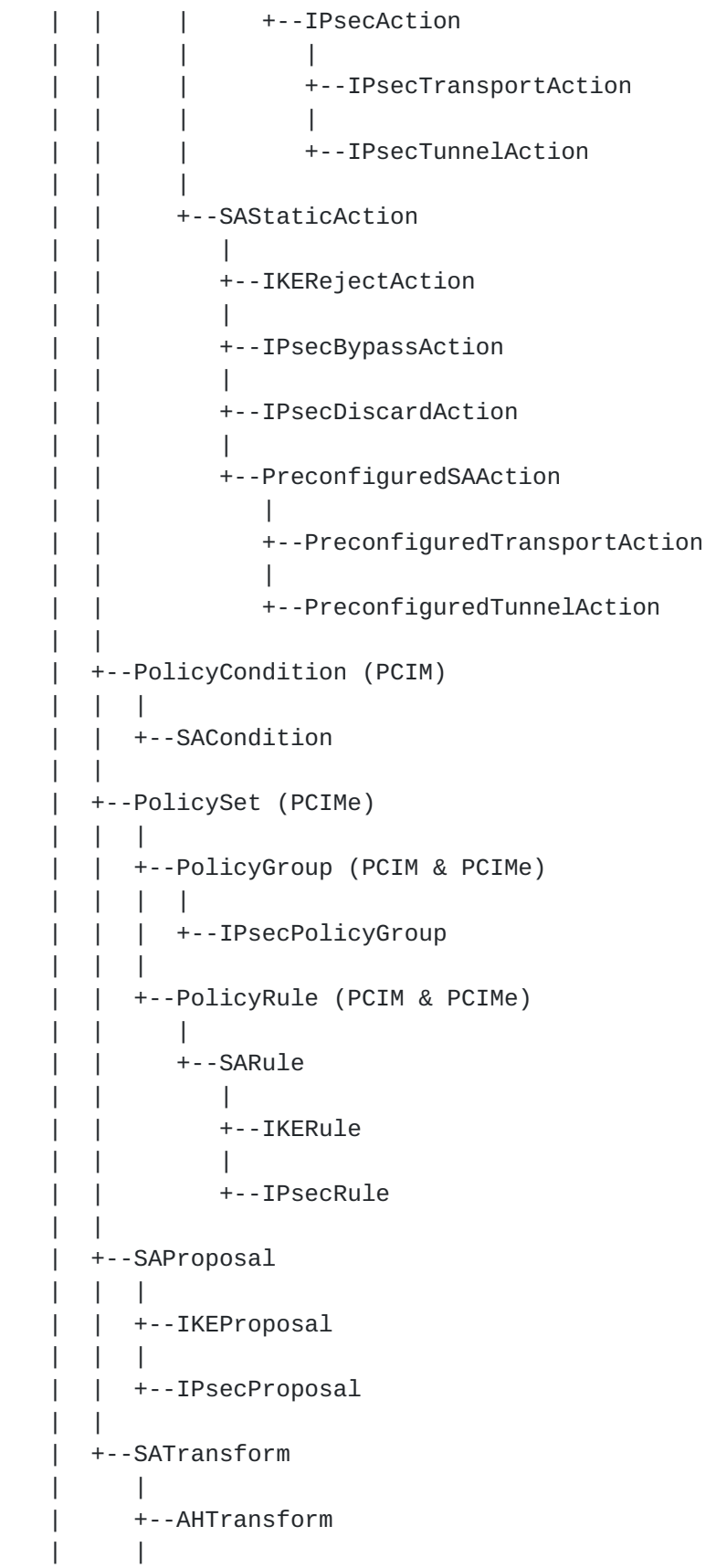
Like PCIM and PCIMe from which it is derived, the IPsec Configuration Policy Model derives from and uses classes defined in the DMTF [DMTF] Common Information Model (CIM). The following tree

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 from which to derive new classes but are only referenced are not included this inheritance hierarchy, but can be

found in the appropriate DMTF document [CIMCORE], [CIMUSER] or [CIMNETWORK].




+--IKENegotiationAction
+--IKEAction

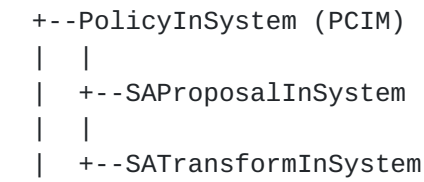

+--IPsecAction
+--IPsecTransportAction
+--IPsecTunnelAction
+--SAStaticAction
+--IKERejectAction
+--IPsecBypassAction
+--IPsecDiscardAction
+--PreconfiguredSAAction
+--PreconfiguredTransportAction
+--PreconfiguredTunnelAction
+--PolicyCondition (PCIM)
+--SACondition
+--PolicySet (PCIMe)
+--PolicyGroup (PCIM & PCIMe)
+--IPsecPolicyGroup
+--PolicyRule (PCIM & PCIMe)
+--SARule
+--IKERule
+--IPsecRule
+--SAProposal
+--IKEProposal
+--IPsecProposal
+--SATransform
+--AHTransform

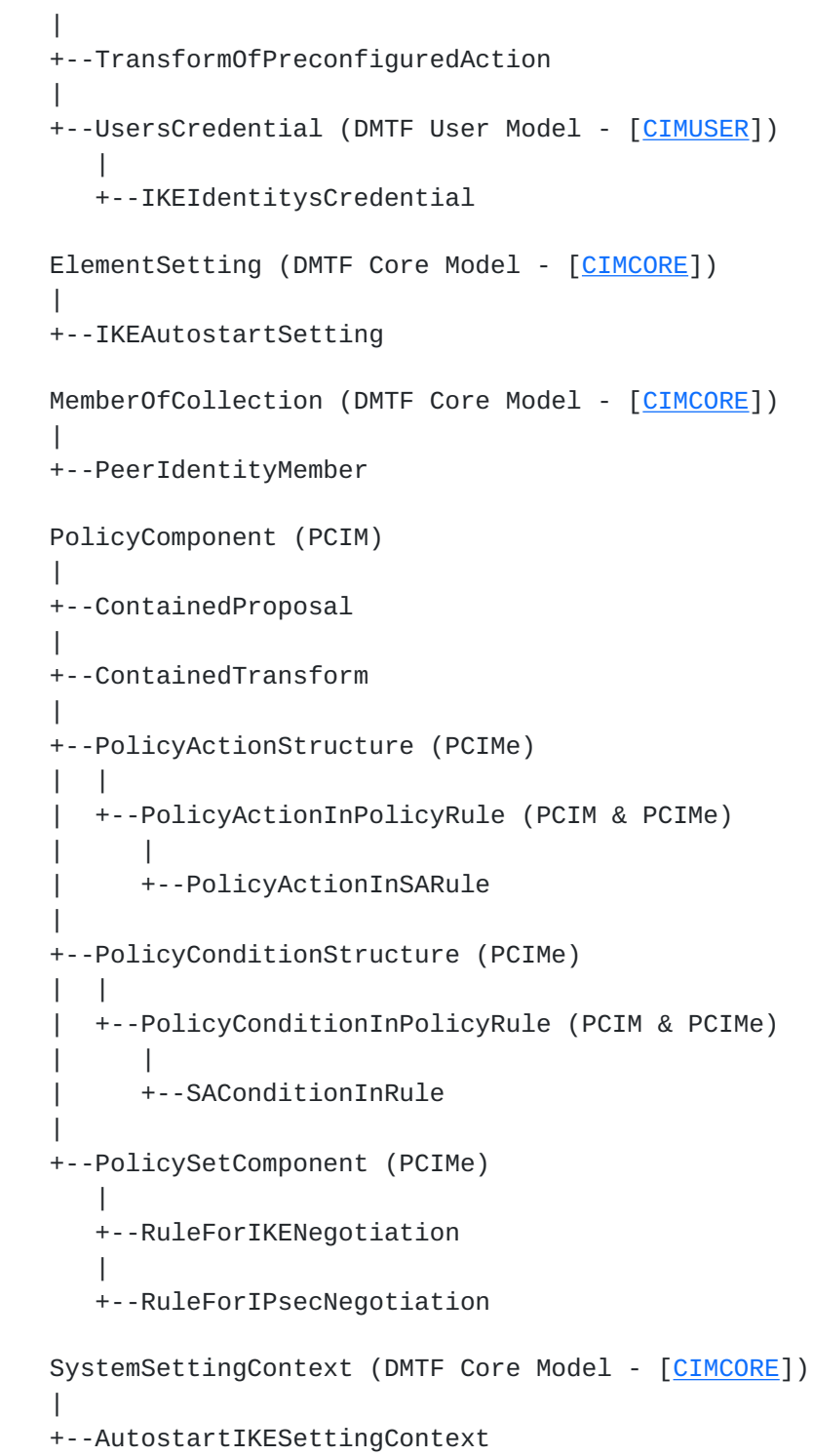
```
   |     +--ESPTransform
   |     |
   |     +--IPCOMPTransform
   |
   +--Setting (DMTF Core Model - [CIMCORE])
```

```
|  |
|  +--SystemSetting (DMTF Core Model - [CIMCORE])
|     |
|     +--AutostartIKESetting
|
+--SystemConfiguration (DMTF Core Model - [CIMCORE])
   |
   +--AutostartIKEConfiguration
```

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 associations classes that are not being introduced as part of IPsec model).

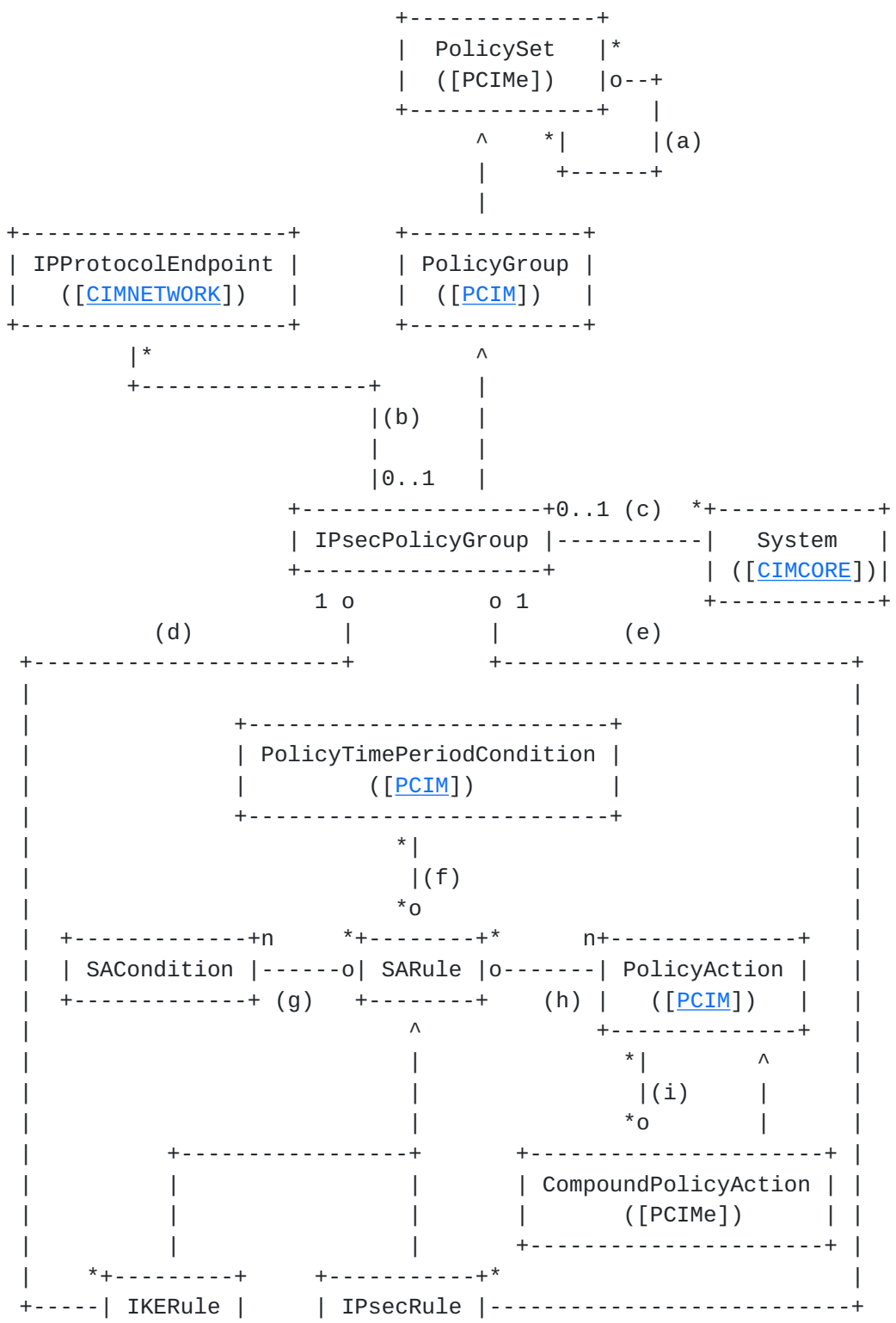
```
Dependency (DMTF Core Model - [CIMCORE])
|
+--AcceptCredentialsFrom
|
+--ElementAsUser (DMTF User Model - [CIMUSER])
|  |
|  +--EndpointHasLocalIKEIdentity
|  |
|  +--CollectionHasLocalIKEIdentity
|
+--FilterOfSACondition
|
+--HostedPeerGatewayInformation
|
+--HostedPeerIdentityTable
|
+--IKEAutostartConfiguration
|
+--IKEServiceForEndpoint
|
+--IKEServicePeerGateway
|
+--IKEServicePeerIdentityTable
|
+--IKEUsesCredentialManagementService
|
+--IPsecPolicyForEndpoint
|
+--IPsecPolicyForSystem
|
+--PeerGatewayForPreconfiguredTunnel
|
+--PeerGatewayForTunnel
|
```


+--PolicyInSystem (PCIM)
| |
| +--SAProposalInSystem
| |
| +--SATransformInSystem


|
+--TransformOfPreconfiguredAction
|
+--UsersCredential (DMTF User Model - [CIMUSER])
|
+--IKEIdentitysCredential
ElementSetting (DMTF Core Model - [CIMCORE])
|
+--IKEAutostartSetting
MemberOfCollection (DMTF Core Model - [CIMCORE])
|
+--PeerIdentityMember
PolicyComponent (PCIM)
|
+--ContainedProposal
|
+--ContainedTransform
|
+--PolicyActionStructure (PCIMe)
|
+--PolicyActionInPolicyRule (PCIM & PCIMe)
|
+--PolicyActionInSARule
|
+--PolicyConditionStructure (PCIMe)
|
+--PolicyConditionInPolicyRule (PCIM & PCIMe)
|
+--SAConditionInRule
|
+--PolicySetComponent (PCIMe)
|
+--RuleForIKENegotiation
|
+--RuleForIPsecNegotiation
SystemSettingContext (DMTF Core Model - [CIMCORE])
|
+--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) RuleForIKENegotiation
(e) RuleForIPsecNegotiation
(f) PolicyRuleValidityPeriod ([PCIM])
(g) SAConditionInRule
(h) PolicyActionInSARule
(i) PolicyActionInPolicyAction ([PCIMe])

An IPsecPolicyGroup represents the set of policies that are used on an interface. This IPsecPolicyGroup 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 SADB. The IPsec rules represent the Security Policy Database. The SADB itself is not modeled by this document.

The rules usage can be described as (see also 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 negotiated SA will then be installed in the SADB.

4.1. The Class IPsecPolicyGroup

The class IPsecPolicyGroup serves as a container of either other IPsecPolicyGroups or a set of IKERules and a set of IPsecRules. The class definition for IPsecPolicyGroup is as follows:

NAME	IPsecPolicyGroup
DESCRIPTION	Either a set of IPsecPolicyGroups or a set of IKERules and a set of IPsecRules.
DERIVED FROM	PolicyGroup (see [PCIM] & [PCIMe])
ABSTRACT	FALSE

```
PROPERTIES   PolicyGroupName (from PolicyGroup)
             PolicyDescisionStrategy (from PolicySet)
```

NOTE: for derivations of the schema that are used for policy distribution to an IPsec device (for example, COPS-PR), the server may follow all of PolicySetComponent associations and create one policy group which is simply a set of all of the IKE rules and a set of all of the IPsec rules. See the section on the PolicySetComponent aggregation for information on merging multiple IPsecPolicyGroups.

4.2. 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 valid IpsecPolicyGroup MUST contain SARules that each have a unique associated priority number in 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 PolicyRule)
             PolicyDecisionStrategy (from PolicySet)
             LimitNegotiation
```

4.2.1. 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"

4.2.2 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 possibly with different modes (main mode then aggressive mode) and/or with possibly 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 all of the actions in aggregated set according to their defined order. The execution continues regardless of failures.

"Do Until Failure" causes the execution of all actions according to predefined order until the first failure in execution of an action instance.

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 SA creation. Even if the net effect of the aggregated actions is failure, those created SA 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 being the local IP address and the destination IP address being 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.

4.2.3 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 if 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
```

4.3. 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
```

4.3.1. 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), 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.

IdentityContexts is an array of strings. The multiple values in the array are 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 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" or "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

4.4. 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

4.6. The Association Class IPsecPolicyForEndpoint

The class IPsecPolicyForEndpoint associates an IPsecPolicyGroup with

a specific network interface. If an IPProtocolEndpoint of a system does not have an IPsecPolicyForEndpoint-associated IPsecPolicyGroup, then the IPsecPolicyForSystem associated IPsecPolicyGroup 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 IPsecPolicyGroup[0..1]]
```

4.6.1. 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 an IPsecPolicyGroup instance may be associated with zero or more IPProtocolEndpoint instances.

4.6.2. The Reference Dependent

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

4.7. The Association Class IPsecPolicyForSystem

The class IPsecPolicyForSystem associates an IPsecPolicyGroup with a specific system. If an IPProtocolEndpoint of a system does not have an IPsecPolicyForEndpoint-associated IPsecPolicyGroup, then the IPsecPolicyForSystem associated IPsecPolicyGroup 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 IPsecPolicyGroup[0..1]]
```

4.7.1. 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 an IPsecPolicyGroup instance may have an association to zero or more System instances.

4.7.2. The Reference Dependent

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

4.8. The Aggregation Class RuleForIKENegotiation

The class RuleForIKENegotiation associates an IKERule with the IPsecPolicyGroup that contains it. The class definition for RuleForIKENegotiation is as follows:

```
NAME         RuleForIKENegotiation
DESCRIPTION  Associates an IKERule with the IPsecPolicyGroup that
             contains it.
DERIVED FROM PolicySetComponent (see [PCIME])
ABSTRACT     FALSE
PROPERTIES   Priority (from PolicySetComponent)
             GroupComponent [ref IPsecPolicyGroup [1..1]]
             PartComponent [ref IKERule [0..n]]
```

4.8.1. The Property Priority

For a description of this property, see [PCIME].

4.8.2. The Reference GroupComponent

The property GroupComponent is inherited from PolicyRuleInPolicyGroup and is overridden to refer to an IPsecPolicyGroup instance. The [1..1] cardinality indicates that an IKERule instance may be contained in one and only one IPsecPolicyGroup instance (i.e., IKERules are not shared across IPsecPolicyGroups).

4.8.3. The Reference PartComponent

The property PartComponent is inherited from PolicyRuleInPolicyGroup and is overridden to refer to an IKERule instance. The [0..n] cardinality indicates that an IPsecPolicyGroup instance may contain zero or more IKERule instances.

4.9. The Aggregation Class RuleForIPsecNegotiation

The class RuleForIPsecNegotiation associates an IPsecRule with the IPsecPolicyGroup that contains it. The class definition for RuleForIPsecNegotiation is as follows:

```
NAME         RuleForIPsecNegotiation
DESCRIPTION  Associates an IPsecRule with the IPsecPolicyGroup that
             contains it.
DERIVED FROM PolicySetComponent (see [PCIME])
ABSTRACT     FALSE
PROPERTIES   Priority (from PolicySetComponent)
             GroupComponent [ref IPsecPolicyGroup [1..1]]
```

PartComponent [ref IPsecRule [0..n]]

4.9.1. The Property Priority

For a description of this property, see [PCIME].

4.9.2. The Reference GroupComponent

The property GroupComponent is inherited from PolicyRuleInPolicyGroup and is overridden to refer to an IPsecPolicyGroup instance. The [1..1] cardinality indicates that an IPsecRule instance may be contained in only one IPsecPolicyGroup instance (i.e., IPsecRules are not shared across IPsecPolicyGroups).

4.9.3. The Reference PartComponent

The property PartComponent is inherited from PolicyRuleInPolicyGroup and is overridden to refer to an IPsecRule instance. The [0..n] cardinality indicates that an IPsecPolicyGroup instance may contain zero or more IPsecRules instance.

4.10. 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]]
```

4.10.1. The Properties GroupNumber and ConditionNegated

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

4.10.2. 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.

4.10.3. 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.

4.11. 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)

4.11.1. 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.

4.11.2. 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.

4.11.3. 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.

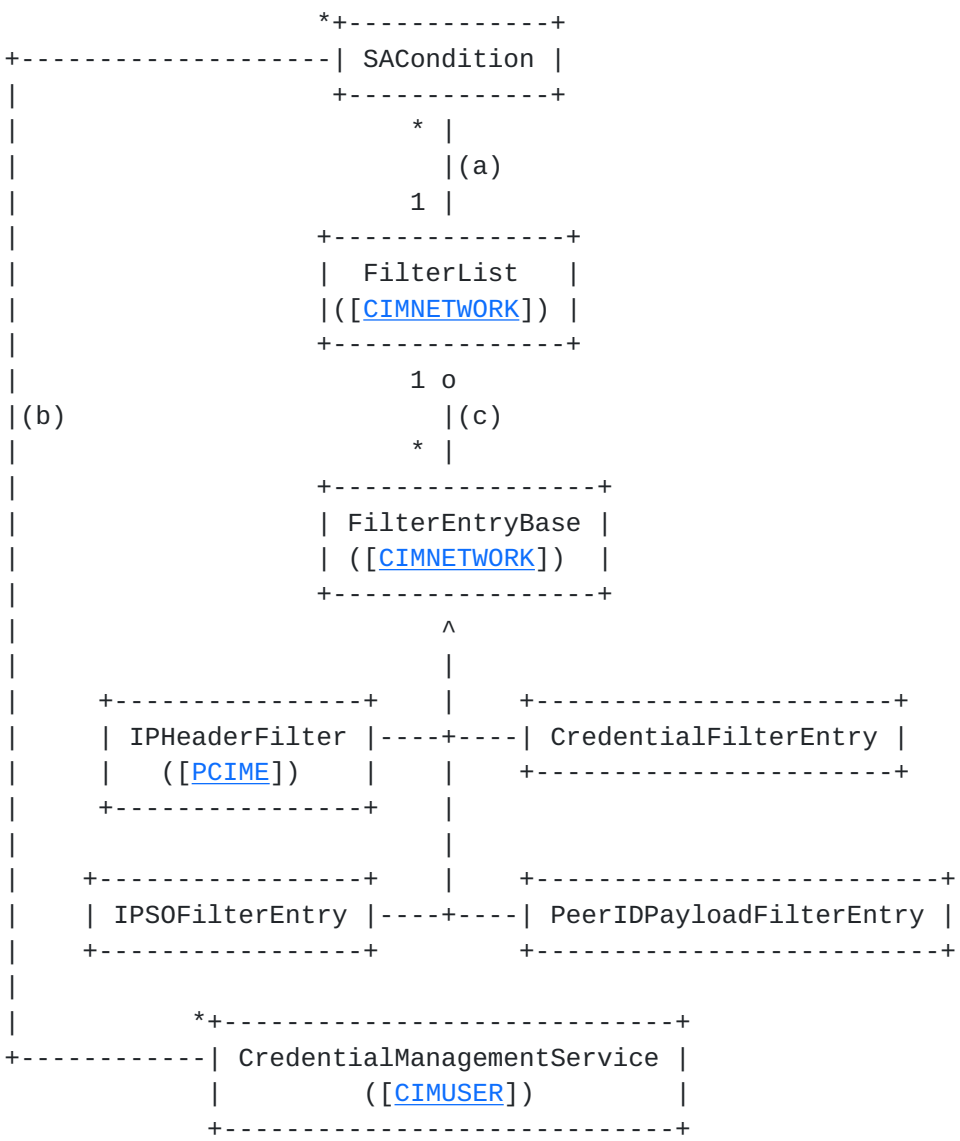
The property is defined as follows:

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 compared 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 IPHeaderFilter

The class IPHeaderFilter 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 flow between the two peers), 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.

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	

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.

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 header values (ClassificationLevel and ProtectionAuthority) as defined in RFC1108. 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        For ClassificationLevel, the values are:
             61 - TopSecret
             90 - Secret
             150 - Confidential
             171 - Unclassified
             For ProtectionAuthority, the values 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 "*@company.com" or "193.190.125.0/24".

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        1 - IPv4 Address
             2 - FQDN
             3 - User FQDN
             4 - IPv4 Subnet
             5 - IPv6 Address
             6 - IPv6 Subnet
             7 - IPv4 Address Range
             8 - IPv6 Address Range
             9 - DER-Encoded ASN.1 X.500 Distinguished Name
             10 - DER-Encoded ASN.1 X.500 GeneralName
             11 - Key ID
```

5.5.2. The Property MatchIdentityValue

The property MatchIdentityValue specifies the filter value for comparison with the ID payload, e.g., "*@company.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.
```

Wildcards can be used as well as the prefix notation
for IPv4 addresses:
- a MatchIdentityValue of "*@company.com" will match an
ID payload of "JDOE@COMPANY.COM"

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

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 make
             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 SAConditions instance.

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 validate 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

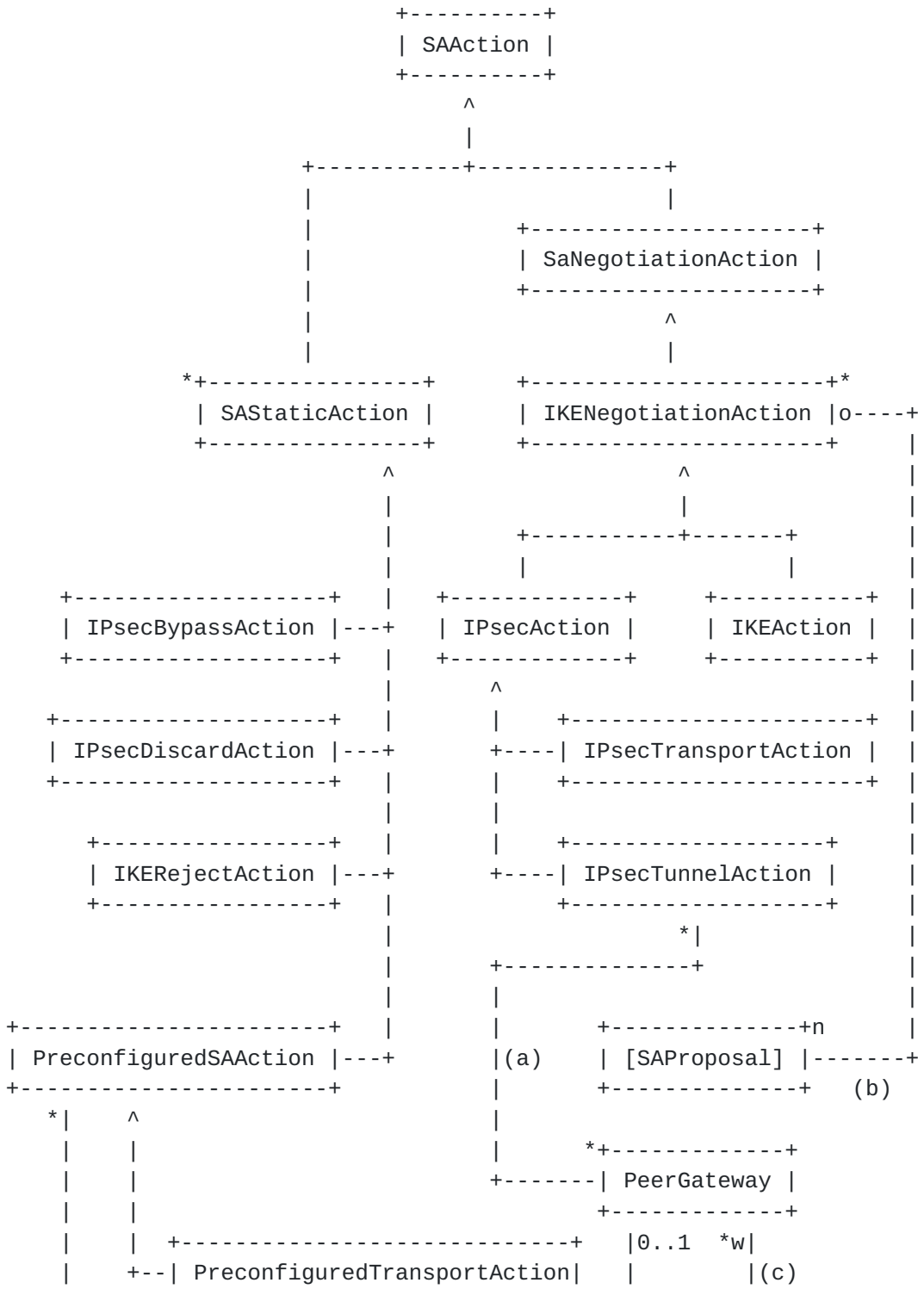
The property Antecedent is inherited from Dependency and is overridden to refer to a CredentialManagementService instance. The [0..n] cardinality indicates that an SACondition instance may be associated with zero or more CredentialManagementServices instance.

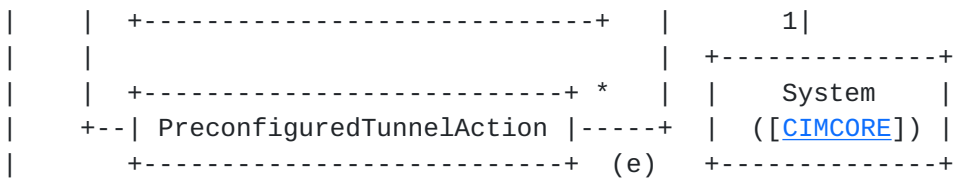
5.7.2. The Reference Dependent

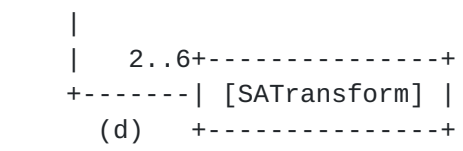
The property Dependent is inherited from Dependency and is overridden to refer to an SACondition instance. The [0..n] cardinality indicates that a CredentialManagementService instance may be associated with zero or more SAConditions instance.

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.




+-----------------------------+
1|
+--------------+
PreconfiguredTunnelAction
(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, IKERejectAction are executed. The property is defined as follows:

NAME	DoPacketLogging
DESCRIPTION	Specifies the 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 32-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 smallest of the

value of this LifetimeSeconds property and of the value of the MaxLifetimeSeconds property of the associated SATransform. Except if the value of this LifetimeSeconds property is zero, then there will be no lifetime associated to this SA.

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" (resp. "OUT") for inbound SA (resp. 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	FALSE
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 32-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 amount of kilobytes has been consumed the SA must be deleted from the SADB.

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

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 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 a IKE negotiation. Although the class is concrete, is MUST not be instantiated. 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
             RefreshThresholdSeconds
             RefreshThresholdKilobytes
             IdleDurationSeconds
```

6.10.1. The Property MinLifetimeSeconds

The property MinLifetimeSeconds specifies the minimum seconds 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 correspondingly expensive Diffie-Hellman operations. The property is defined as follows:

```
NAME         MinLifetimeSeconds
DESCRIPTION  Specifies the minimum acceptable seconds lifetime.
SYNTAX       unsigned 32-bit integer
VALUE        A value of zero indicates that there is no minimum
             value.  A non-zero value specifies the minimum seconds
             lifetime.
```

6.10.2. The Property MinLifetimeKilobytes

The property MinLifetimeKilobytes specifies the minimum kilobytes 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 acceptable kilobytes lifetime.
SYNTAX	unsigned 32-bit integer
VALUE	A value of zero indicates that there is no minimum value. A non-zero value specifies the minimum kilobytes lifetime.

6.10.3. The Property RefreshThresholdSeconds

The property RefreshThresholdSeconds specifies what percentage of the seconds lifetime can expire before IKE should attempt to renegotiate the security association. A random value may be added to the calculated threshold (percentage x seconds lifetime) to reduce the chance of both peers attempting to renegotiate at the same time. The property is defined as follows:

NAME	RefreshThresholdSeconds
DESCRIPTION	Specifies the percentage of seconds lifetime that has expired before the security association is renegotiated.
SYNTAX	unsigned 8-bit integer
VALUE	A value between 1 and 100 representing a percentage. A value of 100 indicates that the security association should not be renegotiated until the seconds lifetime has been reached.

6.10.4. The Property RefreshThresholdKilobytes

The property RefreshThresholdKilobytes specifies what percentage of the kilobyte lifetime can expire before IKE should attempt to renegotiate the IPsec security association. A random value may be added to the calculated threshold (percentage x kilobyte lifetime) to reduce the chance of both peers attempting to renegotiate at the same time. Note, that as with the property MinLifetimeKilobytes, this property is probably only relevant to IPsecAction sub-classes. The property is defined as follows:

NAME	RefreshThresholdKilobytes
DESCRIPTION	Specifies the percentage of kilobyte lifetime that has expired before the IPsec security association is renegotiated.
SYNTAX	unsigned 8-bit integer
VALUE	A value between 1 and 100 representing a percentage. A value of 100 indicates that the IPsec security association should not be renegotiated until the kilobyte lifetime has been reached.

6.10.5. 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 32-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. Although the class is concrete, is MUST not be instantiated. 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	FALSE
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 the 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   RefreshThresholdDerivedKeys
             ExchangeMode
             UseIKEIdentityType
             VendorID
             AggressiveModeGroupId
```

6.14.1. The Property RefreshThresholdDerivedKeys

The property RefreshThresholdDerivedKeys specifies what percentage of the derived key limit (see the LifetimeDerivedKeys property of IKEProposal) can expire before IKE should attempt to renegotiate the IKE phase 1 security association. A random value may be added to the calculated threshold (percentage x derived key limit) to reduce the chance of both peers attempting to renegotiate at the same time. The property is defined as follows:

```
NAME         RefreshThresholdKilobytes
DESCRIPTION  Specifies the percentage of derived key limit that has
             expired before the IKE phase 1 security association is
             renegotiated.
SYNTAX       unsigned 8-bit integer
VALUE        A value between 1 and 100 representing a percentage.  A
             value of 100 indicates that the IKE phase 1 security
             association should not be renegotiated until the
             derived key limit has been reached.
```

6.14.2. 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
```

6.14.3. 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        1 - IPv4 Address
                2 - FQDN
                3 - User FQDN
                4 - IPv4 Subnet
```

```
                5 - IPv6 Address
                6 - IPv6 Subnet
                7 - IPv4 Address Range
                8 - IPv6 Address Range
                9 - DER-Encoded ASN.1 X.500 Distinguished Name
                10 - DER-Encoded ASN.1 X.500 GeneralName
                11 - Key ID
```

6.14.4. 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).
```

6.14.5. 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
```

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        1 - IPv4 Address
             2 - FQDN
             3 - User FQDN
             4 - IPv4 Subnet
             5 - IPv6 Address
             6 - IPv6 Subnet
             7 - IPv4 Address Range
             8 - IPv6 Address Range
             9 - DER-Encoded ASN.1 X.500 Distinguished Name
             10 - DER-Encoded ASN.1 X.500 GeneralName
             11 - Key ID
```

6.15.3. The Property PeerIdentity

The property PeerIdentity specifies the IKE identity value of the security gateway. A conversion may be needed between the PeerIdentity string representation and 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 there 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 from two to 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 an PreconfiguredSAAction instance may be associated with from 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 an 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 for 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 one or one PeerGateway with multiple PreconfiguredTunnelActions. The class definition for PeerGatewayForPreconfiguredTunnel is as follows:

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

6.20.1. The Reference Antecedent

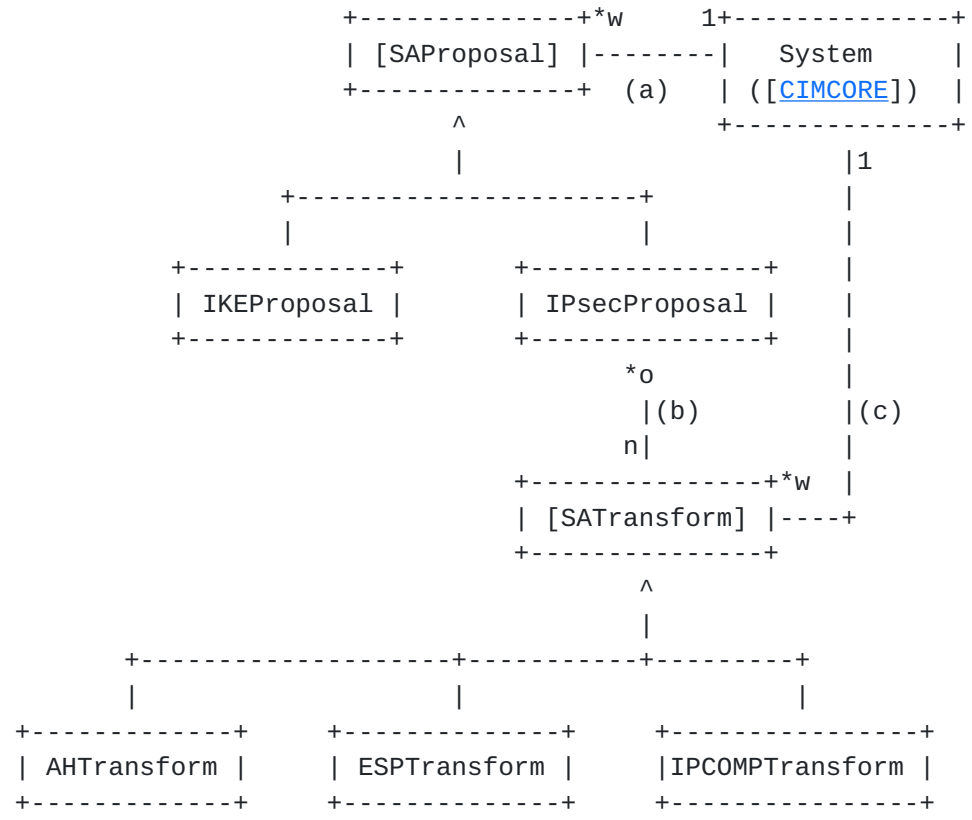
The property Antecedent is inherited from Dependency and is overridden to refer to an PeerGateway instance. The [0..1] cardinality indicates that an PreconfiguredTunnelAction instance may be associated with one PeerGteway instance.

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 an 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   LifetimeDerivedKeys
             CipherAlgorithm
             HashAlgorithm
             PRFAlgorithm
             GroupId
             AuthenticationMethod
             MaxLifetimeSeconds
             MaxLifetimeKilobytes
             VendorID
```

7.2.1. The Property LifetimeDerivedKeys

The property LifetimeDerivedKeys specifies the number of times that a phase 1 key will be used to derive a phase 2 key before the phase 1 security association needs renegotiated. Even though this is not a parameter that is sent in an IKE proposal, it is included in the proposal as the number of keys derived may be a result of the strength of the algorithms in the IKE proposal. The property is defined as follows:

```
NAME         LifetimeDerivedKeys
DESCRIPTION  Specifies the number of phase 2 keys that can be
             derived from the phase 1 key.
SYNTAX       unsigned 32-bit integer
VALUE        A value of zero indicates that there is no limit to the
             number of phase 2 keys that may be derived from the
             phase 1 key; instead the seconds and/or kilobytes
             lifetime will dictate the phase 1 rekeying. A non-zero
             value specifies the number of phase 2 keys that can be
             derived from the phase 1 key.
```

7.2.2. 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.
```

7.2.3. 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.
```

7.2.4. 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.
```

7.2.5. 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        0 - Not applicable: used for aggressive mode. Consult
             [IKE] for other valid values.
```

7.2.6. 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 which includes a proposal that specifies pre-shared key and proposals for any of the public-key authentication methods. Consult [IKE] for valid values.

7.2.7. The Property MaxLifetimeSeconds

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

NAME	MaxLifetimeSeconds
DESCRIPTION	Specifies the maximum amount of time to propose a security association remain valid.
SYNTAX	unsigned 32-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.

7.2.8. The Property MaxLifetimeKilobytes

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

NAME	MaxLifetimeKilobytes
DESCRIPTION	Specifies the maximum kilobyte lifetime to propose a security association remain valid.
SYNTAX	unsigned 32-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.

7.2.9. 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    TransformName
              VendorID
              MaxLifetimeSeconds
              MaxLifetimeKilobytes
```

7.4.1. The Property TransformName

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

```
NAME          TransformName
DESCRIPTION   Specifies a user-friendly name for this transform.
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 maximum amount of time, in seconds, to propose that a security association will remain valid after its creation. The property is defined as follows:

NAME	MaxLifetimeSeconds
DESCRIPTION	Specifies the maximum amount of time to propose a security association remain valid.
SYNTAX	unsigned 32-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.

7.4.4. The Property MaxLifetimeKilobytes

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

NAME	MaxLifetimeKilobytes
DESCRIPTION	Specifies the maximum kilobyte lifetime to propose a security association remain valid.
SYNTAX	unsigned 32-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.

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 AH algorithm to propose.
ABSTRACT	FALSE
PROPERTIES	AHTransformId UseReplayPrevention ReplayPreventionWindowSize

7.5.1. The Property AHTransformId

The property AHTransformId specifies the transform ID of the AH algorithm to propose. 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 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 ESP algorithms to propose.
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 to propose. 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 to propose. 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 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 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 IPCOMP algorithm to propose.
ABSTRACT	FALSE
PROPERTIES	Algorithm DictionarySize PrivateAlgorithm

7.7.1. The Property Algorithm

The property Algorithm specifies the transform ID of the IPCOMP compression algorithm to propose. 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 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

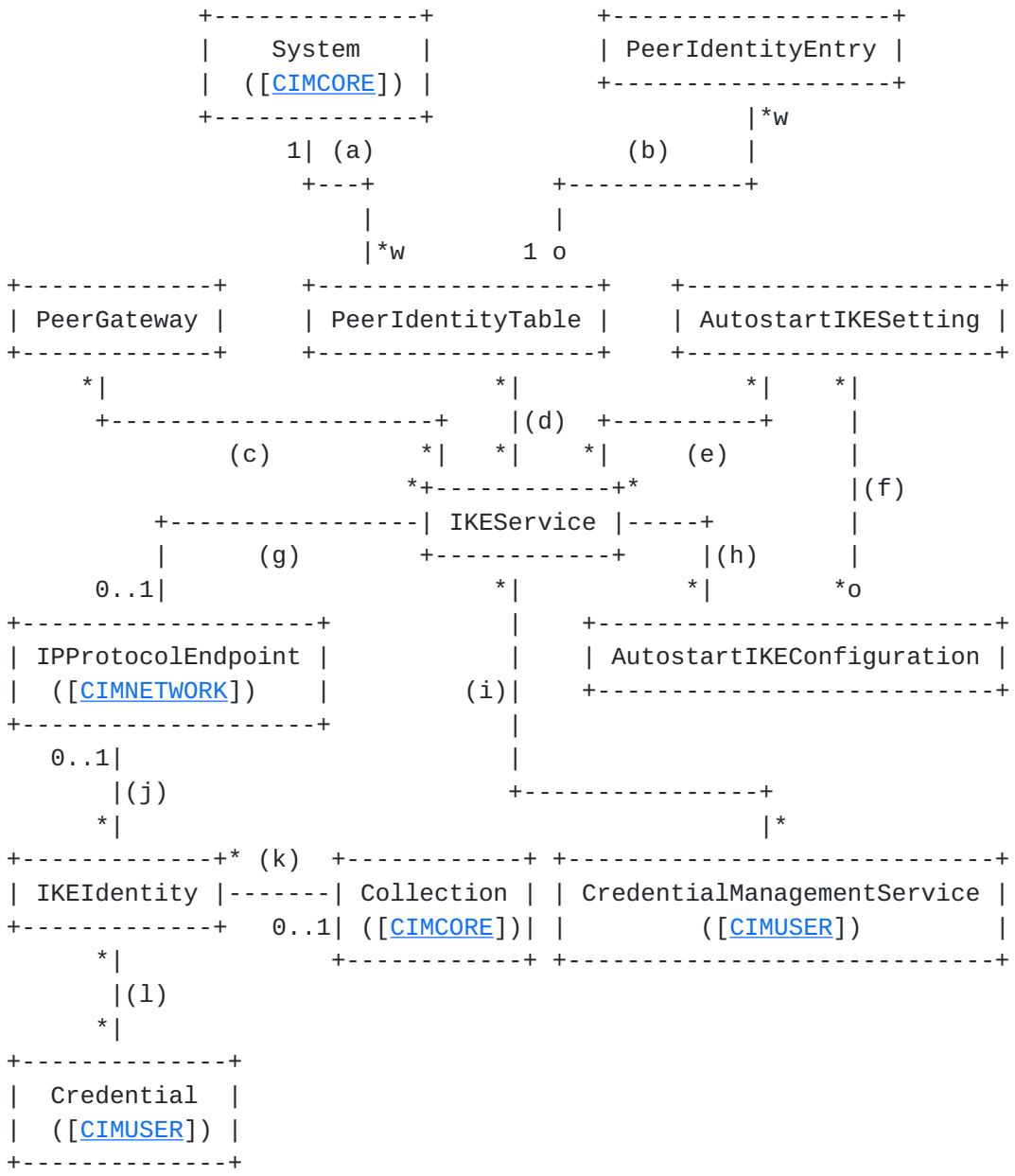
The property Antecedent is inherited from PolicyInSystem and is overridden to refer to a System instance. The [1..1] cardinality indicates that an SATransform instance MUST be associated with one and only one System instance.

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 for that are 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
```

8.3.1. 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 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

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 just setting up a phase 1 security association. When set to False, both phase 1 and 2 negotiations are initiated.
The property is defined as follows:

```
NAME         Phase1Only
DESCRIPTION  Used to indicate which security associations to attempt
             to establish (phase 1 only, or phase 1 and 2).
SYNTAX       boolean
VALUE        true - attempt to establish a phase 1 security
             association
             false - attempt to establish phase 1 and 2 security
             associations
```

8.5.2. The Property AddressType

The property AddressType specifies 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 with policy filter entries and 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 with policy filter entries and 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 with policy filter entries and 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 used in any phase 2 negotiations. The property is defined as follows:

NAME	Protocol
DESCRIPTION	The protocol number used in comparing with 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 8-bit integer
VALUE        The enumeration values are specified in [DOI] section
             4.6.2.1.
```

8.6.2. The Property IdentityValue

The property Identity specifies Value contains a string encoding of the Identity payload. For IKEIdentity instances that are address types, the IdentityValue string value may be omitted and the associated IPProtocolEndpoint or appropriate member of the Collection of endpoints is used. 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 1 and only 1 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 indicates 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 values to high. 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 specifies 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 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 tables specifies which classes, properties, associations and aggregations MUST or SHOULD or MAY be implemented.

```
4. Policy Classes
4.1. The Class IPsecPolicyGroup.............................MUST
4.2. The Class SARule.........................................MUST
4.2.1. The Property PolicyRuleName..........................MAY
4.2.1. The Property Enabled.................................MUST
4.2.1. The Property ConditionListType.......................MUST
4.2.1. The Property RuleUsage...............................MAY
4.2.1. The Property Mandatory...............................MAY
4.2.1. The Property SequencedActions........................MUST
4.2.1. The Property PolicyRoles.............................MAY
4.2.1. The Property PolicyDecisionStrategy..................MAY
4.2.2  The Property ExecutionStrategy.......................MUST
4.2.3  The Property LimitNegotiation........................MAY
```

10. Security Considerations

This document describes a schema for IPsec policy. It does not detail security requirements for storage or delivery of said schema.

Storage and delivery security requirements should be detailed in a comprehensive security policy architecture document.

11. Intellectual Property

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