A Domain Specific Language for Usage Management

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University of New Mexico

October 21, 2011

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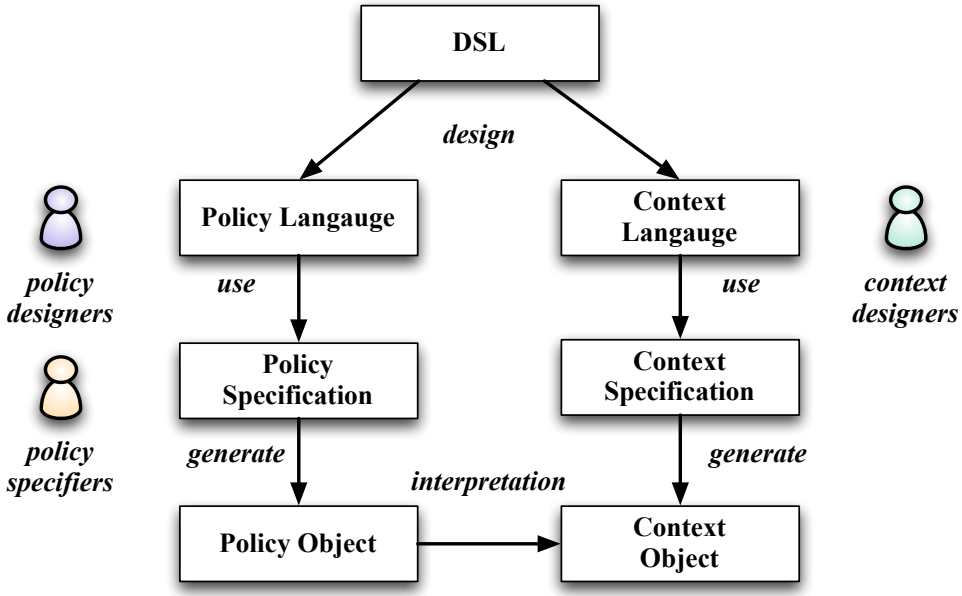
Outline

Introduction

Intro content

Design — Notional Use

Notional Use:



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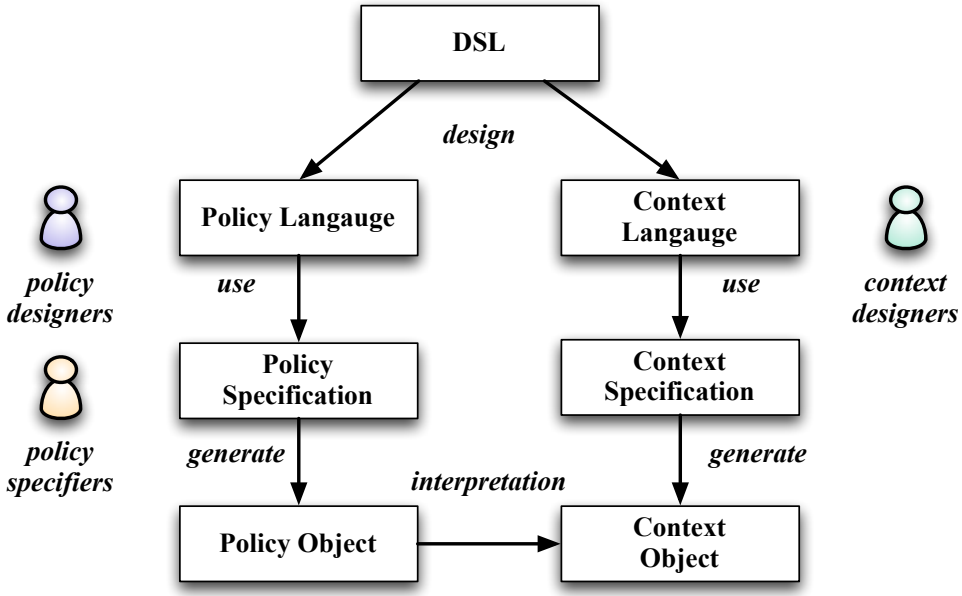

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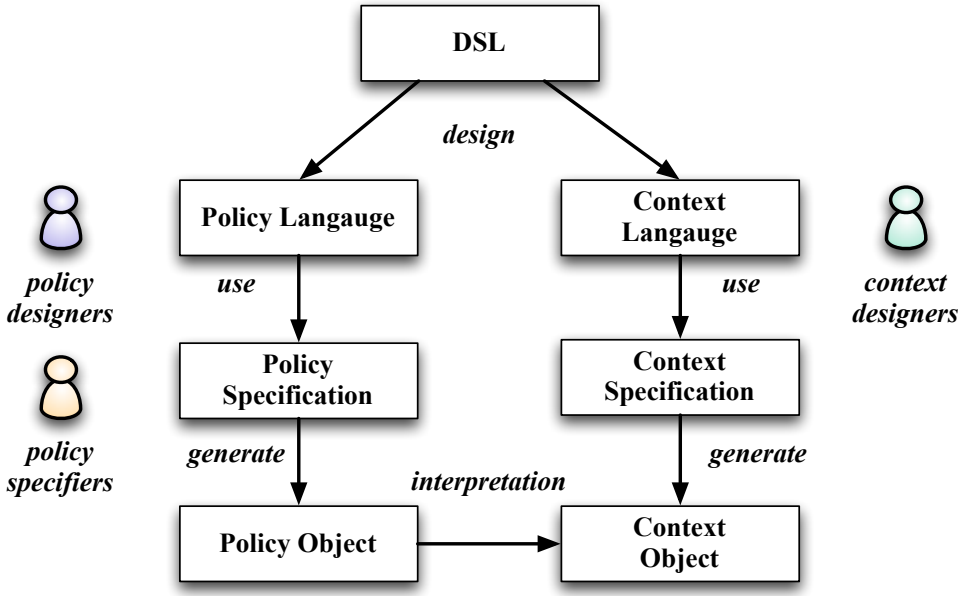

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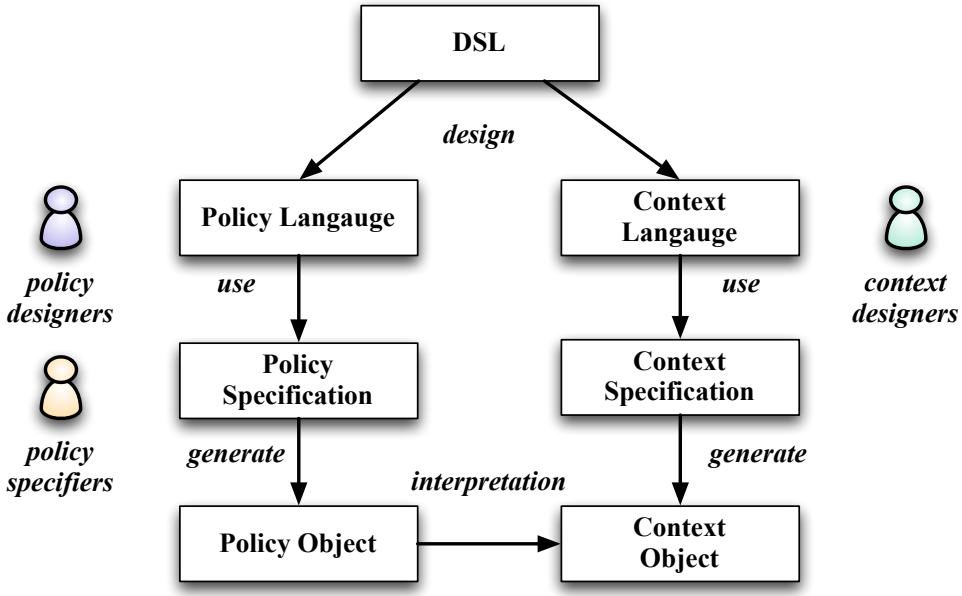

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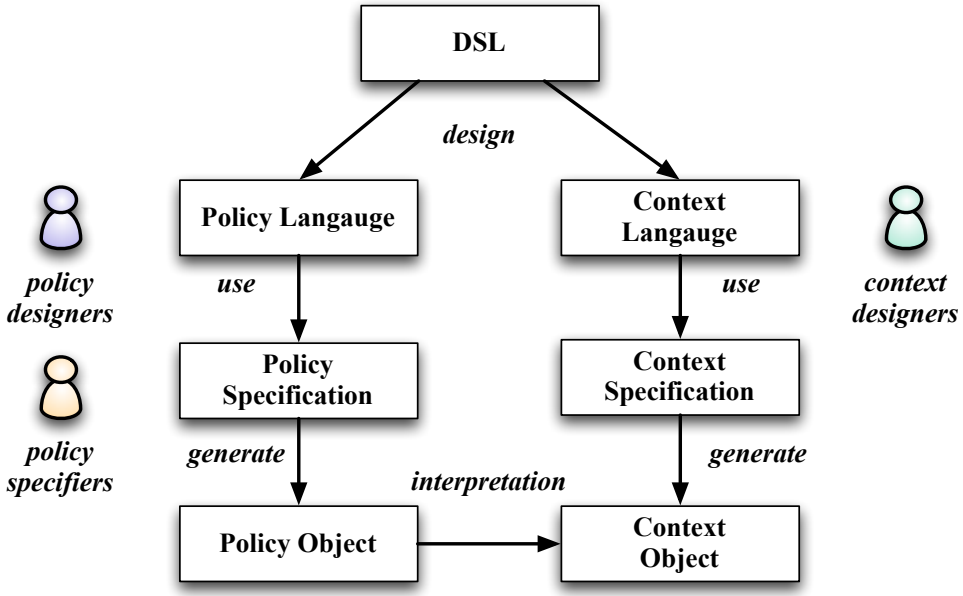

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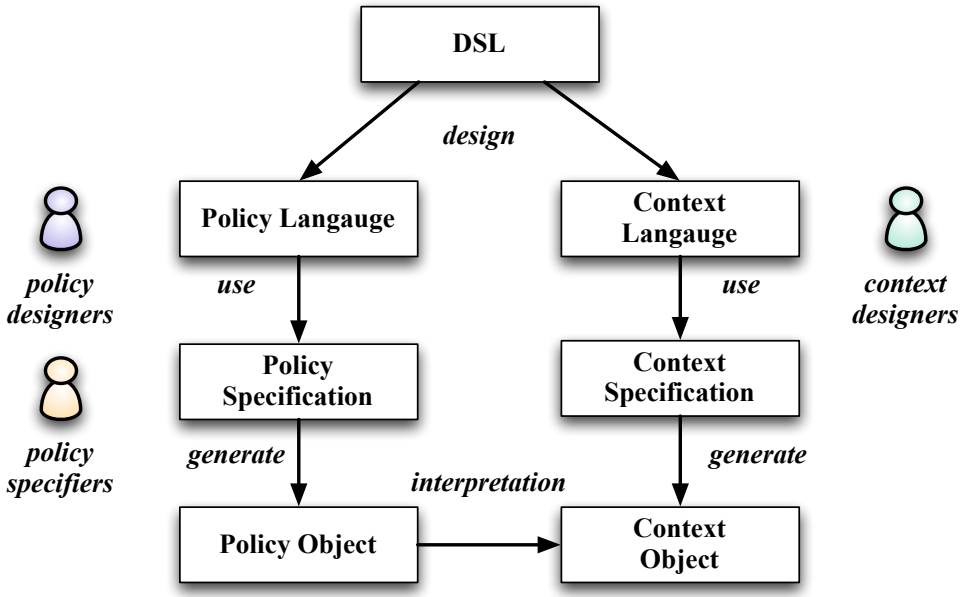

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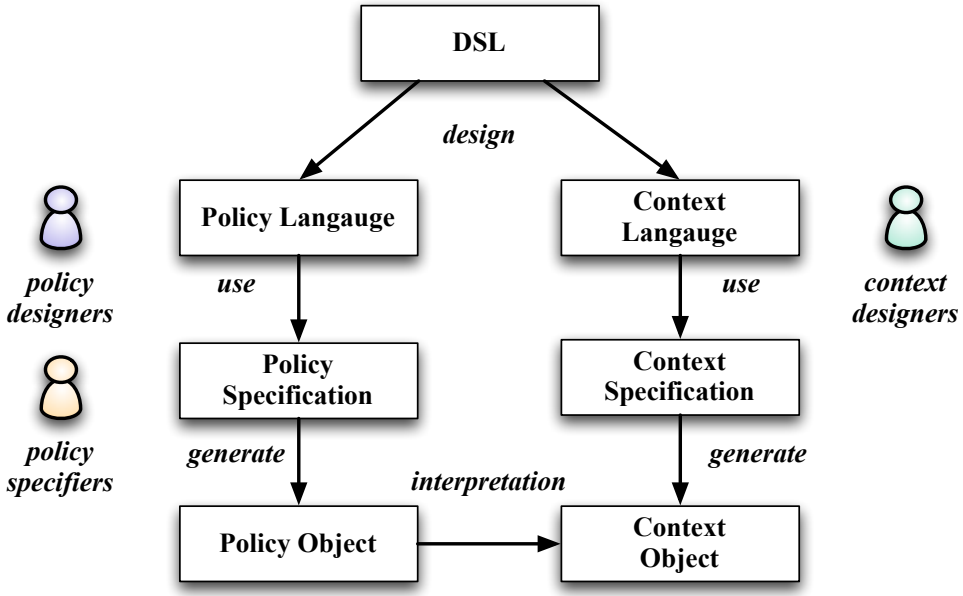

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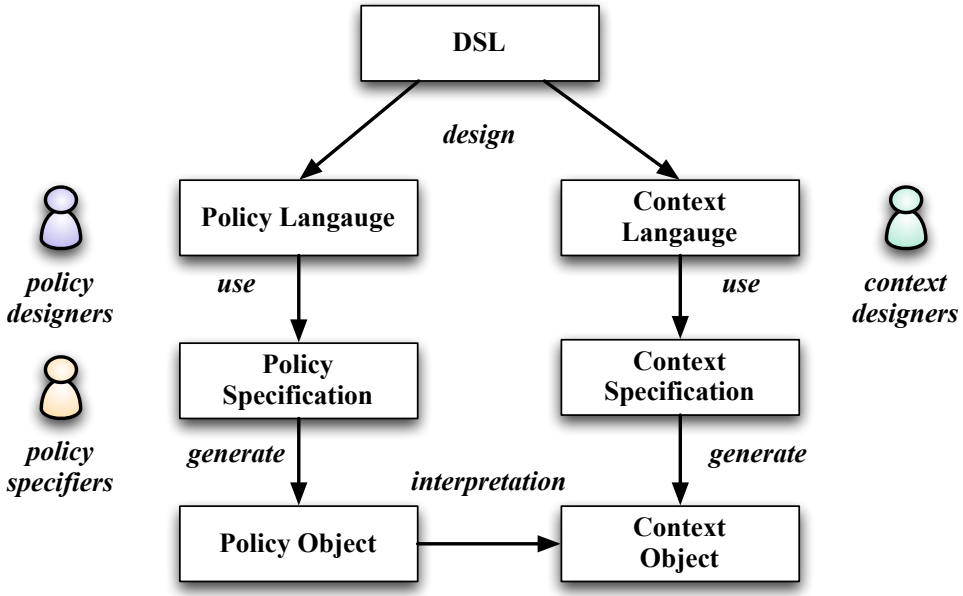

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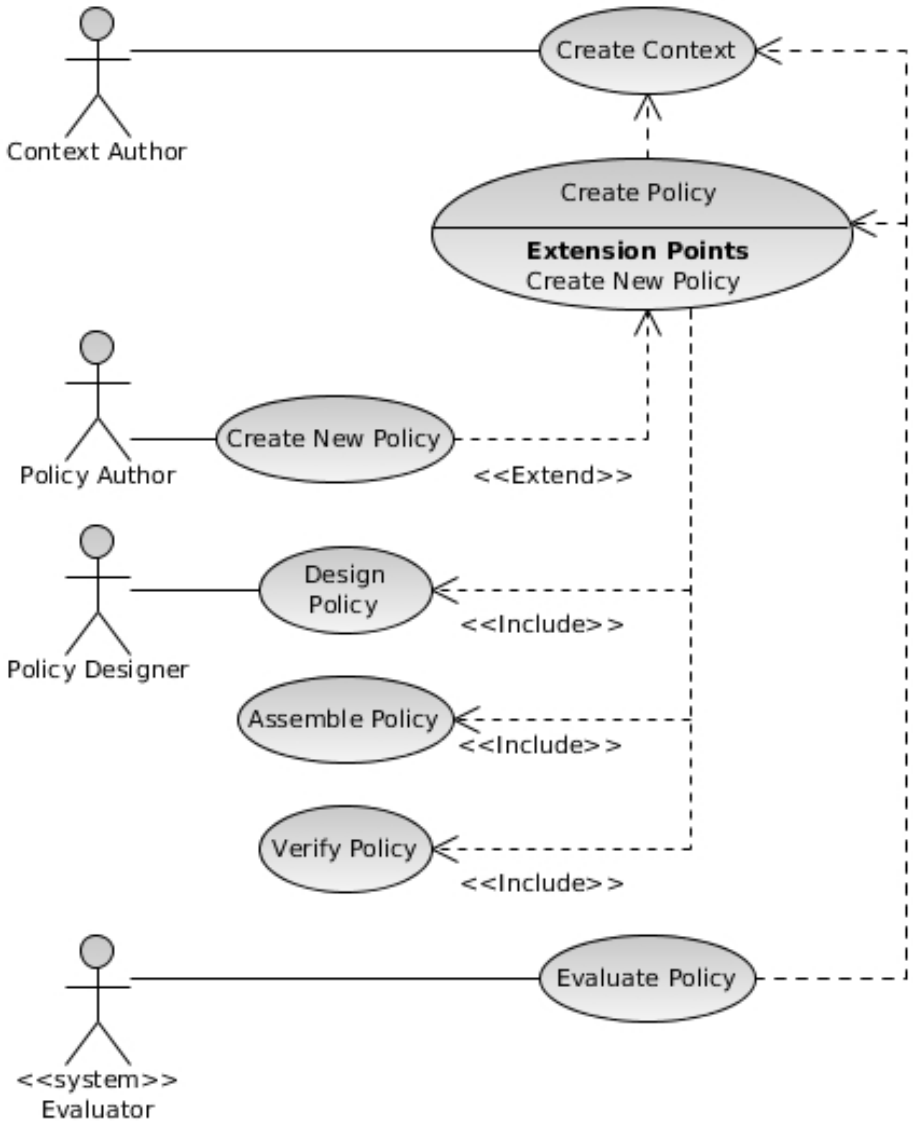

- *Create Context* — Prior to creating a policy, the context in which that policy will be evaluated must be defined.
- *Create Policy* — A designer creates a new type of policy, embodied by specific extension elements or semantic constraints over existing elements. An author will use these to create an instance of a policy.
- *Evaluate Policy* — The policy is evaluated with a context.

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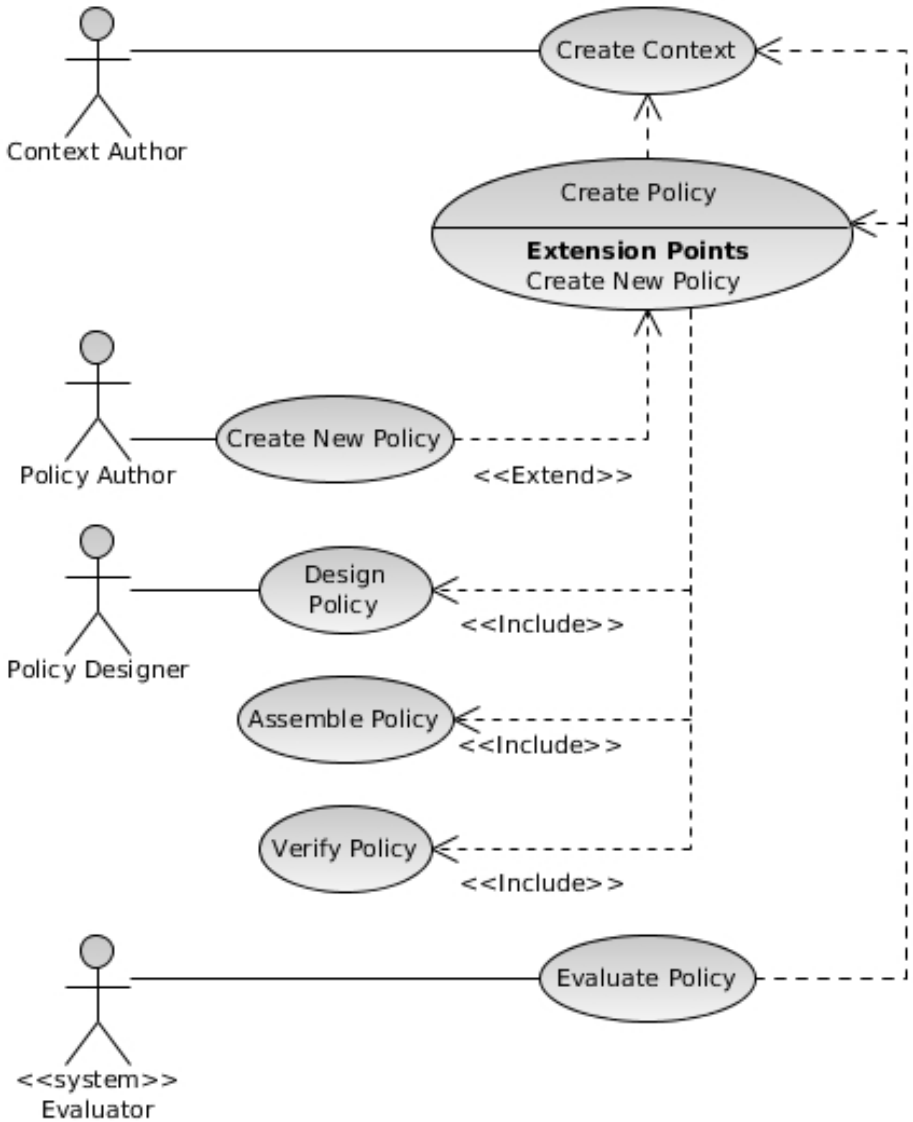

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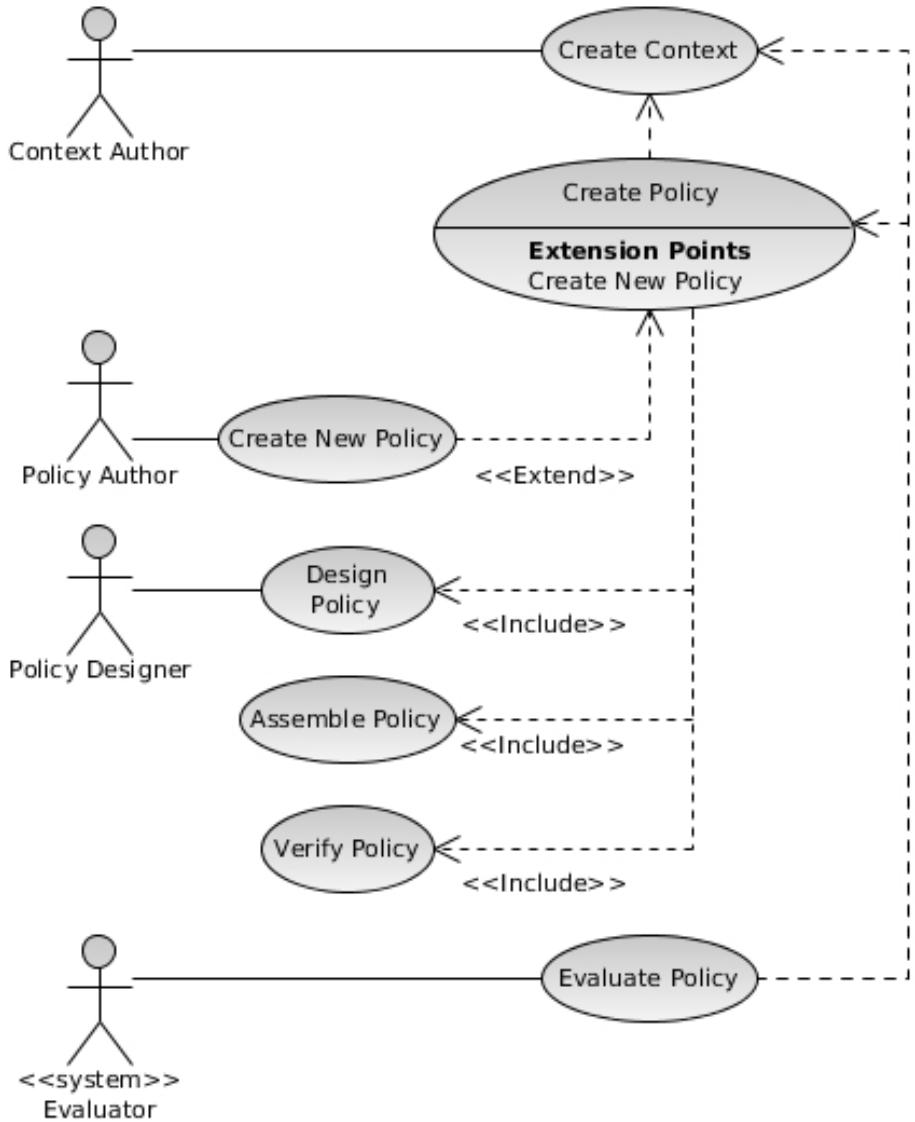

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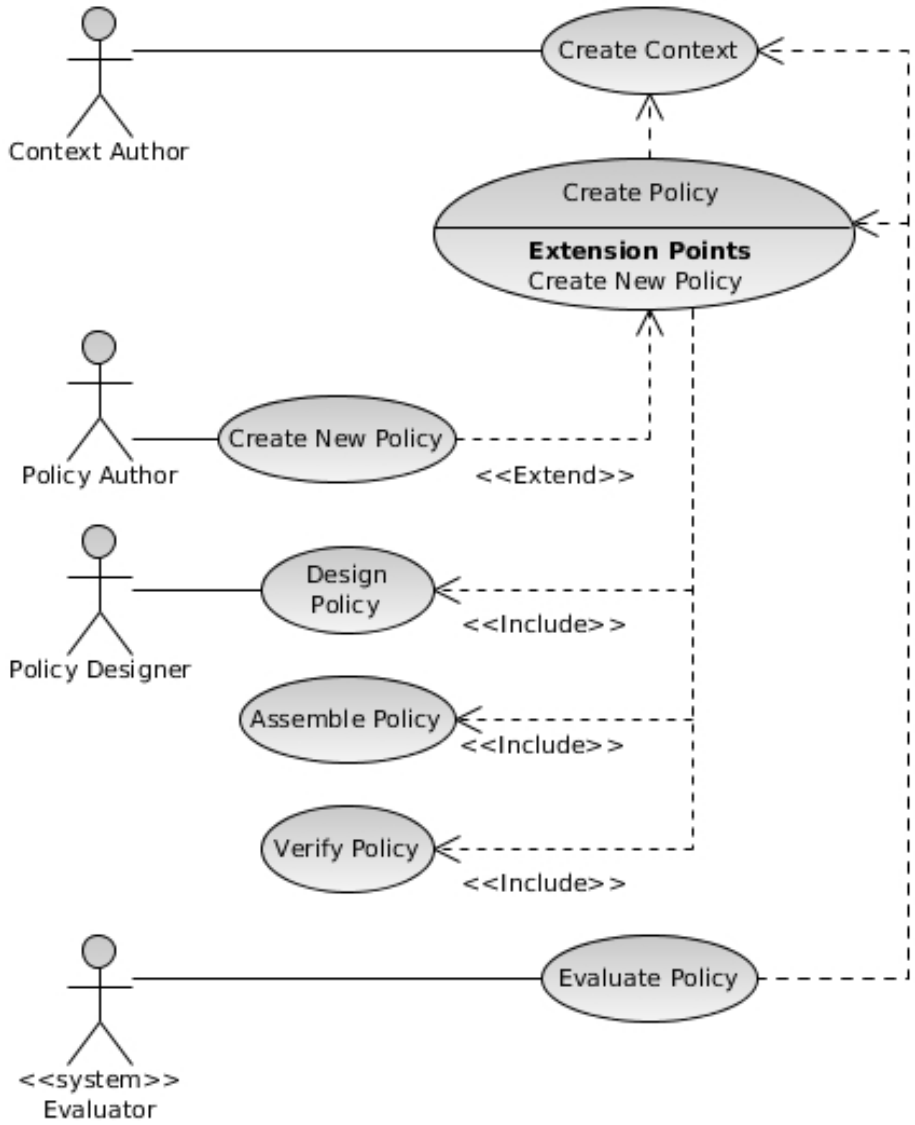

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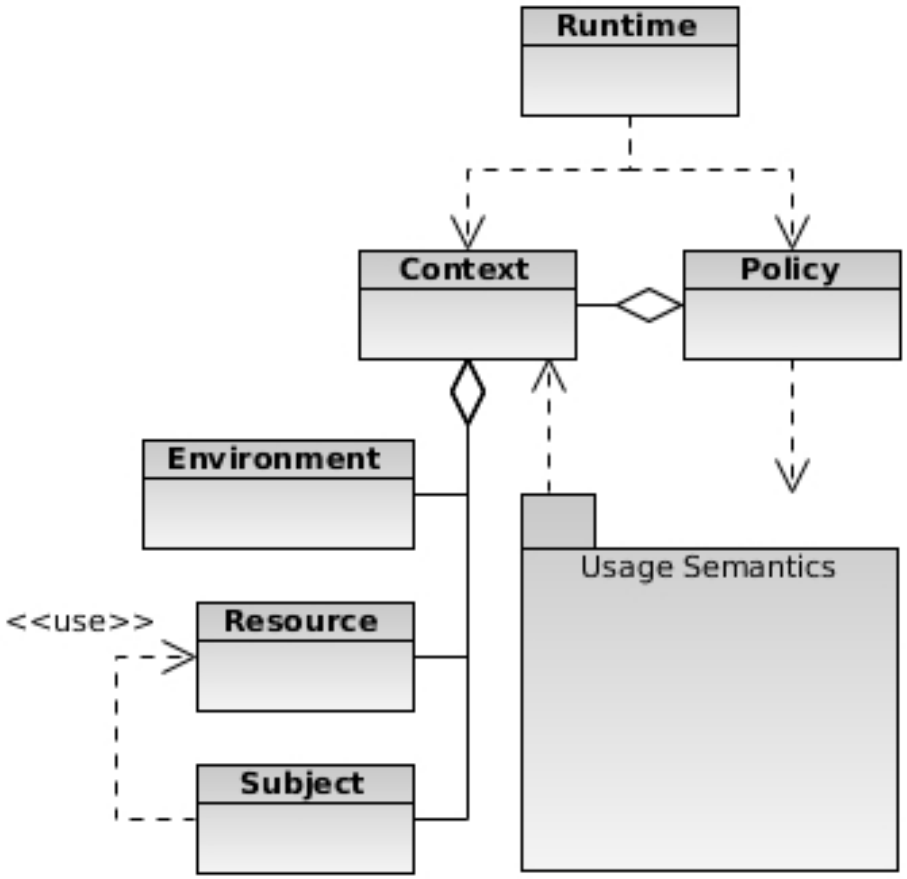

The *Runtime* accesses and activates a *policy* and manages a *context* to which the policy is given a reference.

The *context* has access to information about the *environment*, *resource* managed, and the *subject* using the *resource*.

Interactions are described by specific *usage semantics* embodied in the *policy*.

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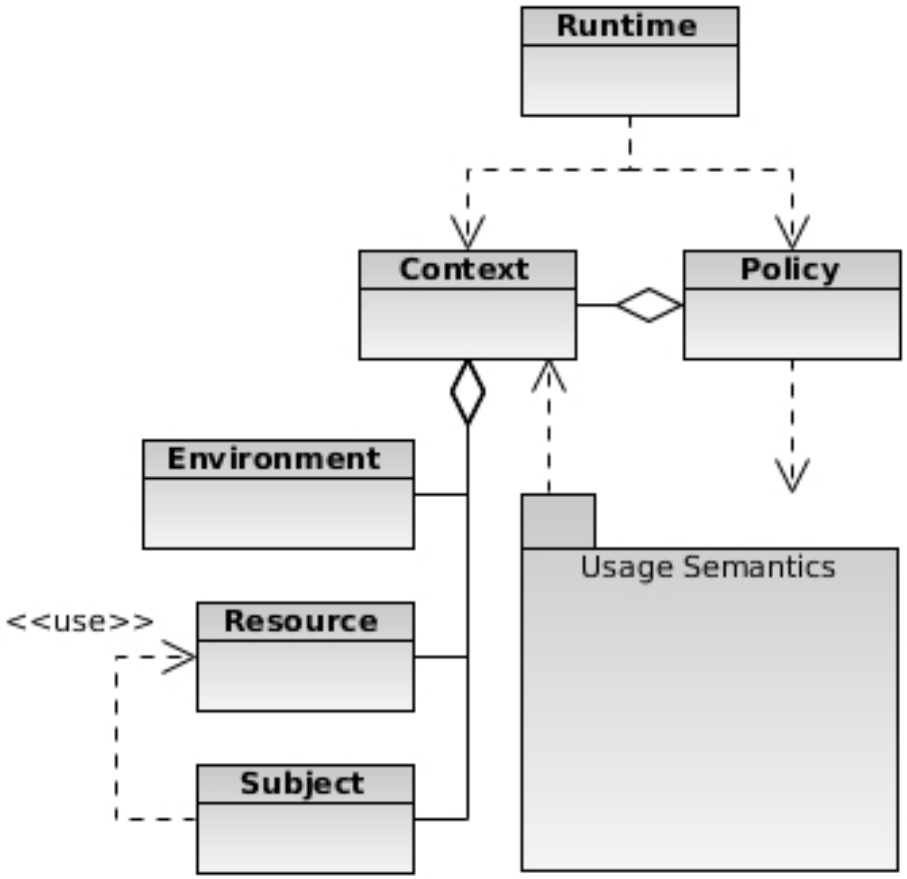

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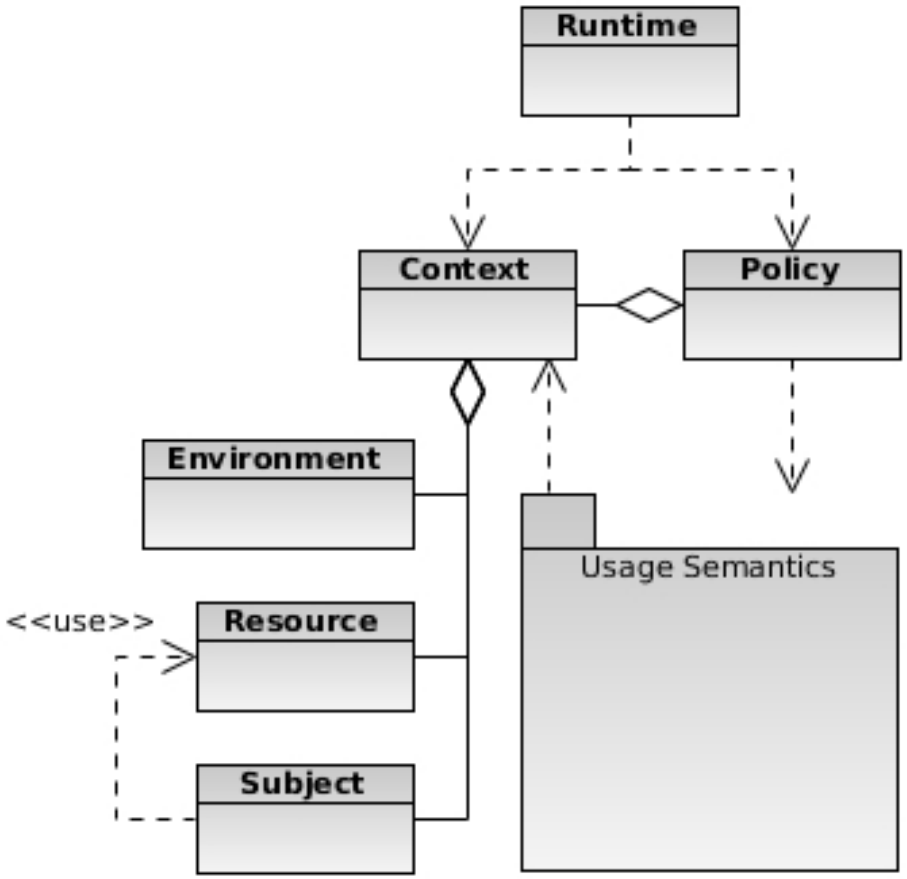

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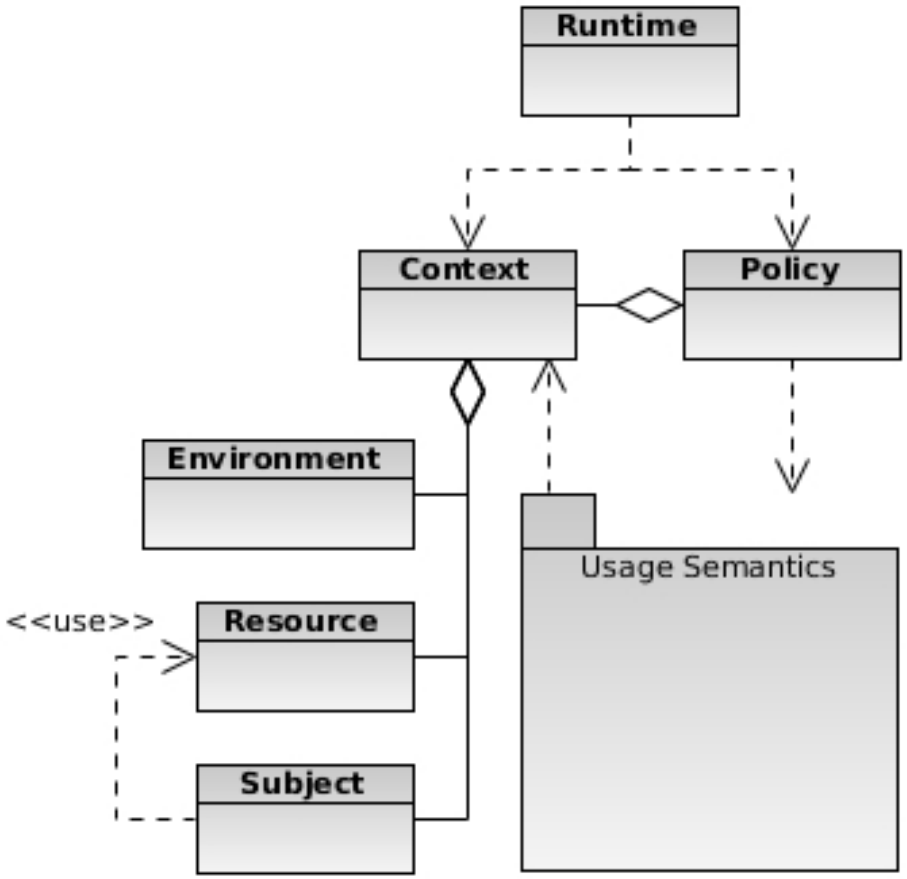

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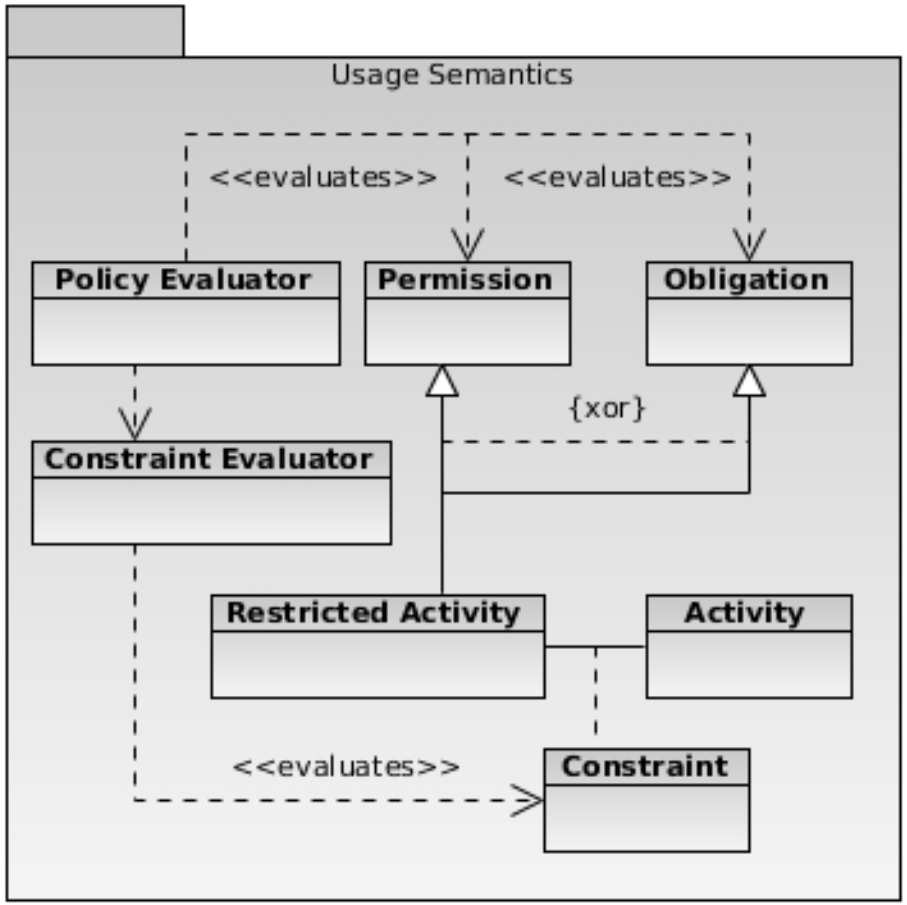

A *policy evaluator* examines and rectifies both *permissions* and *Obligations*.

A *restricted activity* is a specialization of either a *permission* or *obligation*, and is associated with a specific *activity*.

The association between an *activity* and a *restricted activity* is embodied by a *constraint*, which is evaluated by a *constraint evaluator*.

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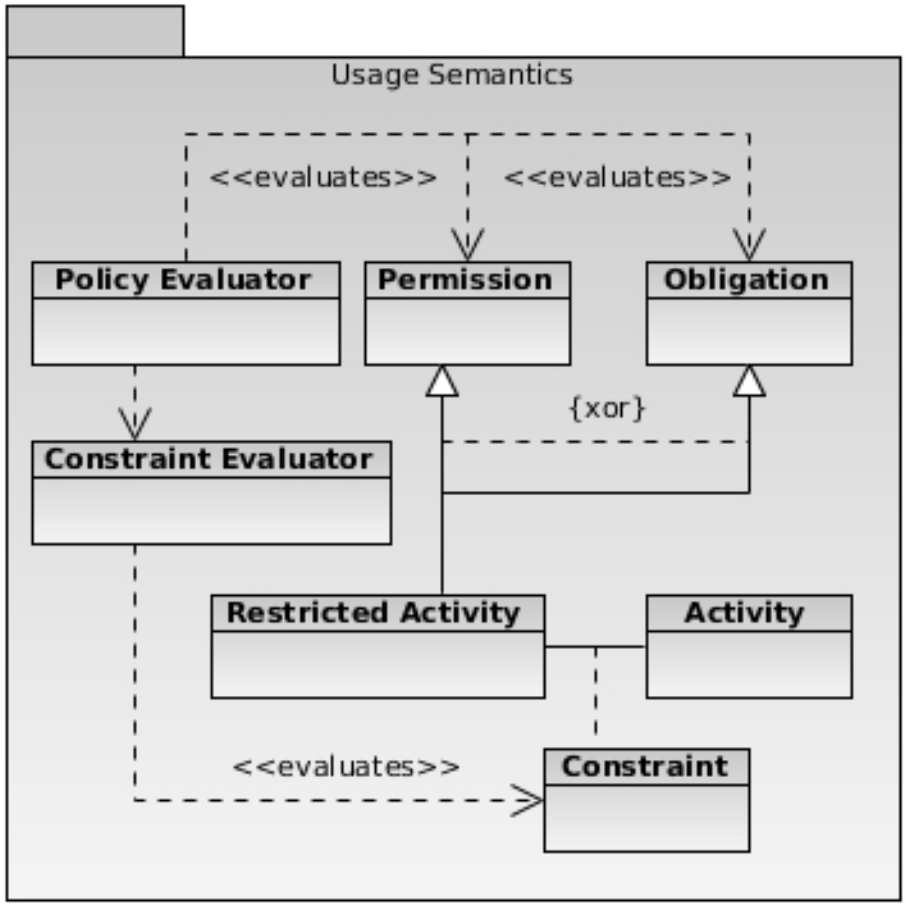

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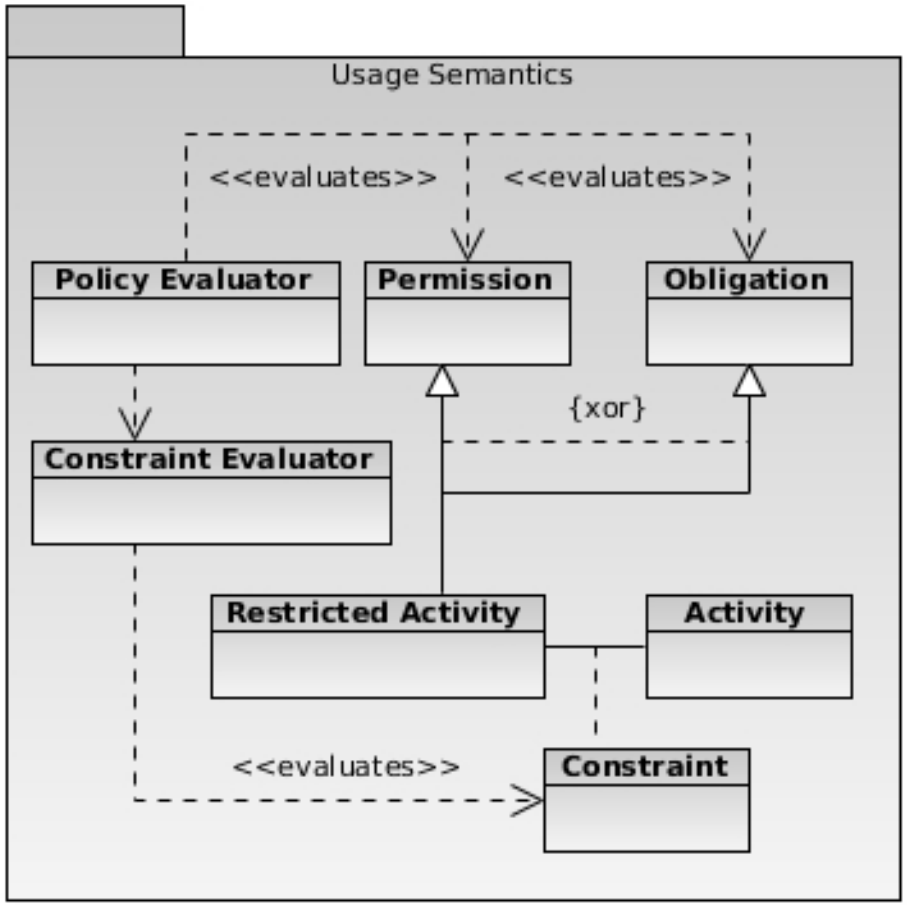

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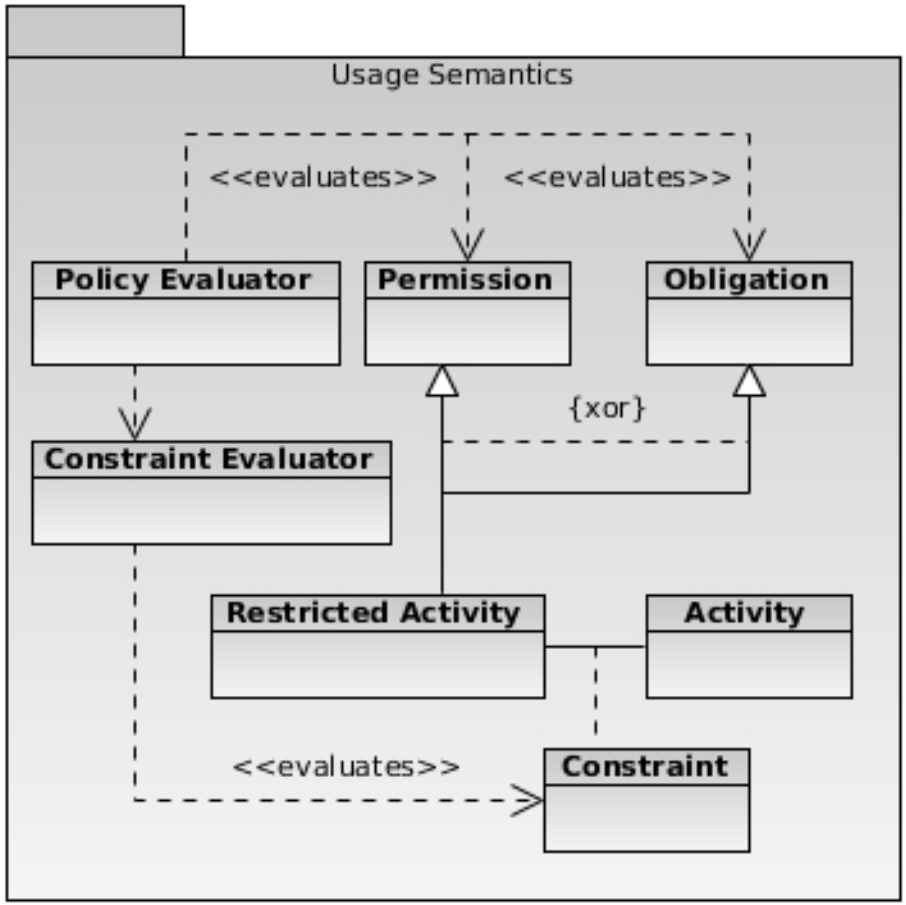

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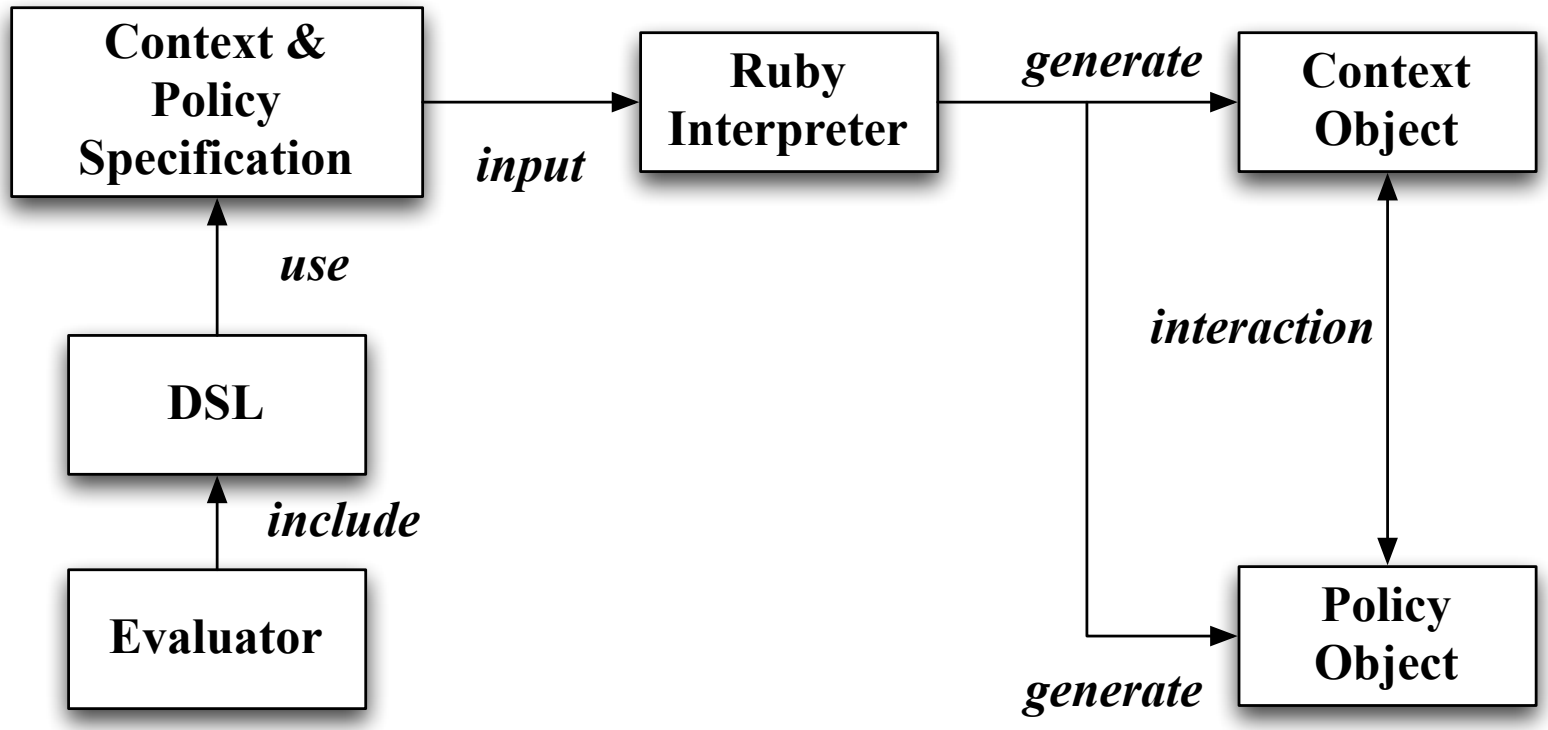
Implementation — Lifecycle

Typical DSL Lifecycle:



Implementation — Attributes

Context			
Entity	**Property (p)**	**Domain (D_p)**	**Functions (F_p)**
Environment (E)	OperatingSystem	{Windows, OSX, SELinux}	equatable
	Device	{Workstation, Handheld, Blackberry, Terminal}	equatable
	SecurityDomain	{ ABNet, SECNet, TELNet, OMNINet}	comparable
Subject (S)	SecurityClearance	{Top Secret, Secret, Confidential}	comparable
	Project	{Zebra, Yuma, Lion}	equatable
	Role	{Alpha, Beta, Delta}	equatable
Resource(R)	SecurityClassification	{ Top Secret, Secret, Confidential, Unclassified}	comparable

Environment (E):
Operating System $\rightarrow$ {Windows, OSX, SELinux} $\rightarrow$ equatable
Device $\rightarrow$ {Workstation, Handheld, Blackberry, Terminal} $\rightarrow$ equatable
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Role $\rightarrow$ {Alpha, Beta, Delta} $\rightarrow$ equatable
Resource(S):
Classification $\rightarrow$ {TopSecret, Secret, Confidential, Unclassified} $\rightarrow$ comparable

Implementation — Properties

```
property :OperatingSystem do
  values :windows, :osx, :selinux
  functions :set, :get, :equatable
end

property :device do
  values :workstation, :handheld, :blackberry, :terminal
  functions :set, :get, :equatable
end

property :project do
  values :zebra, :yuma, :lion
  functions :set, :get, :equatable
end

property :role do
  values :alpha, :beta, :delta
  functions :set, :get, :equatable
end
```

Implementation — Properties

```
property :securitydomain do
  values :abnet, :secnet, :telnet, :omninet
  functions :set, :get, :comparable
  order :abnet, :secnet, :telnet, :omninet
end

property :securityclearance do
  values :topsecret, :secret, :confidential
  functions :set, :get, :comparable
  order :topsecret, :secret, :confidential
end

property :securityclassification do
  values :topsecret, :secret, :confidential,
    :unclassified
  functions :set, :get, :comparable
  order :topsecret, :secret, :confidential,
    :unclassified
end
```

Implementation — Entity, Context

```
entity :subject do
  contains :project, :role, :securityclearance
end

entity :environment do
  contains :device, :operatingsystem, :securitydomain
end

entity :resource do
  contains :securityclassification
end
```

```
context :multilevelsecurity do
  contains :subject, :resource, :environment
end
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Implementation — Activities, Constraints

```
view = activity :view do
  # Some activity to enable viewing
end

c1 = constraint do
  securityclassification >= :secret
    && project == :yuma
    && securityclearance >= :secret
    && device == :blackberry
    && securitydomain >= :secnet
end

restricted_view = restrict view do
  with c1
end
```

```
authorization = activity :project_authorization do
  is_authorized? :yuma
end
```

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Implementation — Policies

```
pol = policy do
  policy_evaluators :standard
  constraint_evauators :propositional
  permit restricted_view do
    when authorization
  end
end
```

```
pol = policy do
  policy_evaluators :standard
  constraint_evauators :propositional
  permit restricted_view do
    when authorization
    count_limit restricted_view, 5
  end
end
```

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Sample — Thing