

# A Domain Specific Language for Usage Management

Christopher C. Lamb  
University of New Mexico  
Department of Electrical and  
Computer Engineering  
Albuquerque, NM 87131-0001  
cclamb@ece.unm.edu

Pramod A. Jamkhedkar  
University of New Mexico  
Department of Electrical and  
Computer Engineering  
Albuquerque, NM 87131-0001  
pramod54@ece.unm.edu

Viswanath Nandina  
University of New Mexico  
Department of Electrical and  
Computer Engineering  
Albuquerque, NM 87131-0001  
vnandina@ece.unm.edu

Mathew Bohnsack  
University of New Mexico  
Department of Electrical and  
Computer Engineering  
Albuquerque, NM 87131-0001  
mbohnsack@ece.unm.edu

Gregory L. Heileman  
University of New Mexico  
Department of Electrical and  
Computer Engineering  
Albuquerque, NM 87131-0001  
heileman@ece.unm.edu

## ABSTRACT

In the course of this paper we will develop a domain specific language (DSL) for expressing usage management policies and associating those policies with managed artifacts. We begin by framing a use model for the language, including generalized use cases, a loose ontology, an general supported lifecycle, and specific extension requirements. We then develop the language from that model, demonstrating key syntactic elements and highlighting the technology behind the language while tracing features back to the initial model. We also compare and contrast this DSL with others developed for rights management (e.g. Ponder). We then demonstrate how the DSL supports common usage management and DRM-centric environments, including creative commons, the extensible rights markup language (XRML), and the open digital rights language (ODRL).

## Categories and Subject Descriptors

H.4 [Information Systems Applications]: Miscellaneous;  
D.2.8 [Software Engineering]: Metrics—*complexity measures, performance measures*

## General Terms

Theory

## Keywords

DRM, usage management, software architecture

## 1. INTRODUCTION

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Suspendisse varius mi et dui consequat id faucibus massa elementum. Nunc iaculis magna nec lectus feugiat vulputate.

Sed eu pretium nisl. Sed ipsum urna, vulputate pharetra tincidunt in, aliquet in magna. Nam faucibus suscipit nibh a eleifend. Nulla nisi nunc, vulputate eget sollicitudin ac, interdum quis tortor. Aenean fermentum mollis dui, vel bibendum lorem placerat non. Suspendisse eget sollicitudin orci. Pellentesque metus erat, sagittis eu laoreet sed, ultricies molestie leo. Donec pellentesque massa sed nisl feugiat tempor. Suspendisse convallis purus ac mi posuere varius. Fusce at enim id metus mattis aliquet. Donec elementum adipiscing purus quis egestas.

Quisque euismod pulvinar diam, ut porttitor turpis pharetra non. Proin eu tincidunt lectus. Aenean quis nibh vitae nulla cursus venenatis. Aliquam non dolor eu erat elementum sagittis. Vestibulum viverra tristique eros sit amet elementum. Pellentesque at tellus lorem, vitae convallis purus. Morbi at rhoncus dolor. Integer luctus elit sed elit auctor aliquam. Nulla tincidunt neque in augue adipiscing et consequat dolor fringilla. Cras vulputate dignissim lectus vel consectetur. Ut lorem enim, pulvinar commodo hendrerit vitae, dapibus sit amet turpis. Duis bibendum, turpis et porttitor molestie, magna dolor imperdiet quam, ut scelerisque ante libero sed sem.

Vivamus dictum pellentesque metus quis convallis. Quisque consequat, lacus non hendrerit posuere, nulla risus posuere purus, sit amet vestibulum urna tortor vel erat. Curabitur malesuada sodales diam quis ullamcorper. Aenean lectus lacus, volutpat eu mollis id, semper volutpat leo. Cras turpis neque, rutrum in tempor vitae, egestas ut diam. Nam luctus sagittis euismod. Fusce et lorem tortor, vel bibendum purus. Duis egestas, velit ac faucibus fringilla, magna lectus adipiscing ipsum, vitae porta metus nisi id metus. Morbi eu erat augue. Suspendisse potenti. Maecenas bibendum ultrices urna vitae porta. Aliquam feugiat neque at elit facilisis non aliquet mi adipiscing. Phasellus non lacus quis eros viverra rutrum. Phasellus suscipit suscipit dapibus. Cras quis malesuada augue. Proin hendrerit cursus lectus.

Maecenas vestibulum felis in elit interdum venenatis. Fusce consequat rhoncus justo ut blandit. Pellentesque viverra tellus eget enim cursus quis imperdiet urna consequat. Morbi

nec metus sit amet arcu lacinia tempor non eu tortor. Cras ut massa sed eros porttitor aliquam. Integer justo nisi, scelerisque quis fermentum a, interdum id dui. Aliquam sed arcu eget velit malesuada rutrum. Nullam viverra lectus id tellus scelerisque ac varius metus pellentesque. Nullam leo leo, aliquam id imperdiet a, pellentesque scelerisque ipsum. Phasellus mi velit, ullamcorper ut pellentesque ut, euismod in nisi. Curabitur tincidunt, sapien condimentum congue commodo, lectus ipsum fermentum nunc, tincidunt porttitor mauris augue non massa. Aenean sollicitudin consequat arcu vel congue.

Vivamus vestibulum pulvinar quam nec consectetur. Phasellus bibendum vulputate iaculis. Nullam dictum, mauris a adipiscing porttitor, massa purus mattis magna, id porta erat nibh sed turpis. Morbi laoreet, diam ac iaculis venenatis, libero risus dignissim orci, sit amet consequat diam nisi a ante. Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Proin feugiat ullamcorper nulla sed pellentesque. Nulla facilisi. In varius tincidunt velit, sagittis suscipit dolor pulvinar a. Pellentesque quis lorem turpis, placerat dictum orci. Pellentesque at mattis eros. Nunc luctus, elit id fermentum viverra, leo lorem mattis nisi, et faucibus magna augue dapibus ipsum. Integer pharetra felis non dui fermentum sagittis. Suspendisse sit amet justo sapien, eu aliquet nisl.

## 1.1 Previous Work

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Curabitur vitae dolor elit, vel sagittis justo. Nullam vehicula scelerisque fermentum. Quisque pulvinar, neque sit amet tempor sagittis, risus felis consequat massa, at euismod quam lacus sed sapien. Integer nec viverra mi. Mauris ultricies tellus non nisl tincidunt dictum. Pellentesque pretium lectus consectetur mauris tempor rutrum. Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Duis dictum quam tellus, eu scelerisque elit. Class aptent taciti sociosqu ad litora torquent per conubia nostra, per inceptos himenaeos. Nullam massa leo, commodo id suscipit eu, consectetur at quam. Cum sociis natoque penatibus et magnis dis parturient montes, nascetur ridiculus mus. Etiam eu diam leo, in rutrum justo. Phasellus ut turpis at orci tempor varius. Suspendisse iaculis faucibus bibendum. Etiam eget mollis nunc. Suspendisse potenti. Pellentesque lectus leo, ornare a ultrices a, lacinia in diam. Vivamus eu justo at lacus sodales eleifend consequat id dui. Nullam laoreet rhoncus malesuada. Curabitur sit amet cursus diam.

In hac habitasse platea dictumst. Suspendisse potenti. Nunc eros libero, eleifend eu scelerisque sit amet, varius rutrum felis. Nulla facilisi. Phasellus tincidunt sapien a libero blandit blandit. Fusce rutrum aliquet lacus, non rhoncus risus facilisis at. Mauris semper varius quam et placerat. Fusce sed suscipit mi. Vivamus a ligula ante, in adipiscing velit. Nullam auctor molestie tincidunt. Duis blandit diam et ante congue vitae laoreet elit sodales. Proin eu nulla vitae est tincidunt rhoncus. Duis at ultrices odio.

## 2. LANGUAGE MODEL

Language model

## 3. LANGUAGE

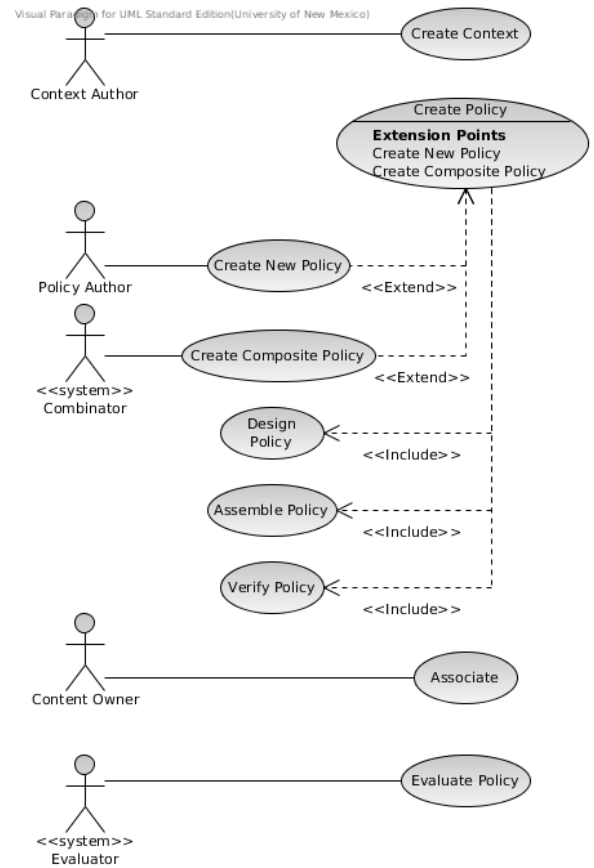


Figure 1: General DSL Use Cases

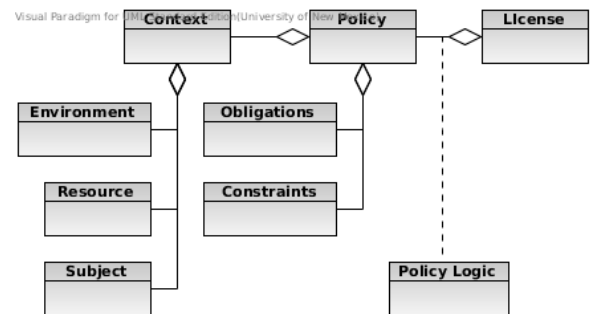


Figure 2: Basic Language Ontology

Language implementation

## 4. APPLIED

Application section

### 4.1 Creative Commons

Creative commons applied

### 4.2 XRML

XRML applied

### 4.3 ODRL

ODRL applied

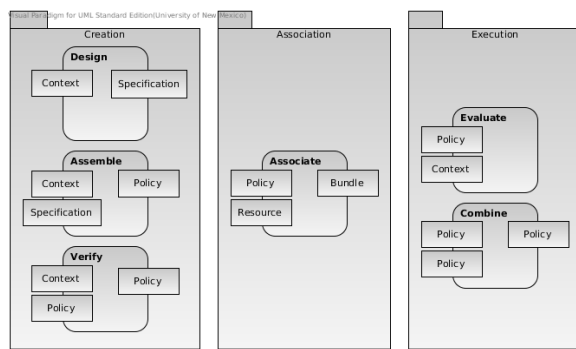


Figure 3: Policy Development Lifecycle

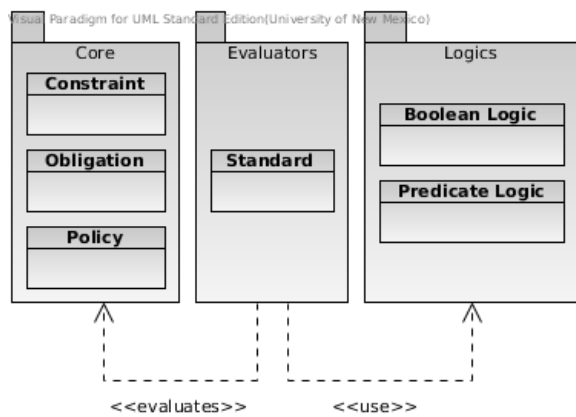


Figure 4: Language Elements

## 5. CONCLUSIONS AND FUTURE WORKS

Conclusion & future works

## 6. REFERENCES