Managed Control of Composite Cloud Systems

Christopher C. Lamb, Pramod A. Jamkhedkar, Gregory L. Heileman, and Chaouki T. Abdallah

Department of Electrical and Computer Engineering
University of New Mexico

June 10, 2011

THE UNIVERSITY of NEW MEXICO

Outline

Areas of Study

Our group:

- *UNM Informatics*: Information security, theory, and architectures; this work is specific to information security
- *Usage Management*: Control of how an artifact is used, covering everything *after* access as well as controlling access itself

Areas of Study

Our group:

- *UNM Informatics*: Information security, theory, and architectures; this work is specific to information security
- *Usage Management*: Control of how an artifact is used, covering everything *after* access as well as controlling access itself

Motivation: We believe people should have control over their own information. Or past motivation for DRM work was to provide content control to content creators. Doing so provides incentive for innovation, and improves quality of life for individuals and society as a whole over time. We believe Usage Management provides the same benefits, and should be unobtrusive.

This motivation holds in this domain as well.

Areas of Study

Our group:

- *UNM Informatics*: Information security, theory, and architectures; this work is specific to information security
- *Usage Management*: Control of how an artifact is used, covering everything *after* access as well as controlling access itself

Motivation: We believe people should have control over their own information. Or past motivation for DRM work was to provide content control to content creators. Doing so provides incentive for innovation, and improves quality of life for individuals and society as a whole over time. We believe Usage Management provides the same benefits, and should be unobtrusive.

This motivation holds in this domain as well.
Acronyms:

- *UM*: Usage Management
- *PMR*: Personal Medical Record (this is also electronic, in this case)

Why is this important?

Utility computing will certainly be the most pervasive future computing model

Why is this important?

Utility computing will certainly be the most pervasive future computing model

- *Mainframes won!*

Why is this important?

Utility computing will certainly be the most pervasive future computing model

- *Mainframes won!*
  - Well, end devices are powerful
  - Cloud computing pervasive for *convenience*, not *technical necessity*.
  - *Still resembles centralized models of the past*

Why is this important?

Utility computing will certainly be the most pervasive future computing model

- *Mainframes won!*
  - Well, end devices are powerful
  - Cloud computing pervasive for *convenience*, not *technical necessity*.
  - *Still resembles centralized models of the past*
- *People should control what they own*
  - Access
  - Retention
  - Distribution

Why is this important?

Utility computing will certainly be the most pervasive future computing model

- *Mainframes won!*
  - Well, end devices are powerful
  - Cloud computing pervasive for *convenience*, not *technical necessity*.
  - *Still resembles centralized models of the past*
- *People should control what they own*
  - Access
  - Retention
  - Distribution

  Organizations should control what they pay for
  - Systems
  - Data
  - Records

Problems

So this is what we would like to see, but problems abound

- *Scalability, performance, usability, infrastructural support...*

Problems

So this is what we would like to see, but problems abound

- *Scalability, performance, usability, infrastructural support...*

Started examining automation and ability to combine service level agreements (SLAs)

- *Automation*
  How we can automate control and enforcement
- *Combine*
  How we can combine multiple SLAs into single SLAs

Problems

So this is what we would like to see, but problems abound

- *Scalability, performance, usability, infrastructural support...*

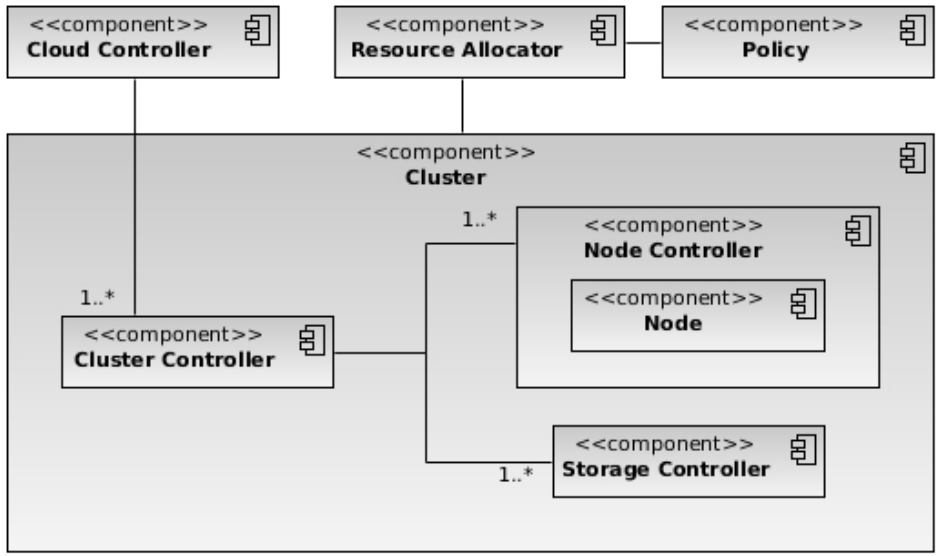
Started examining automation and ability to combine service level agreements (SLAs)

- *Automation*
  How we can automate control and enforcement
- *Combine*
  How we can combine multiple SLAs into single SLAs

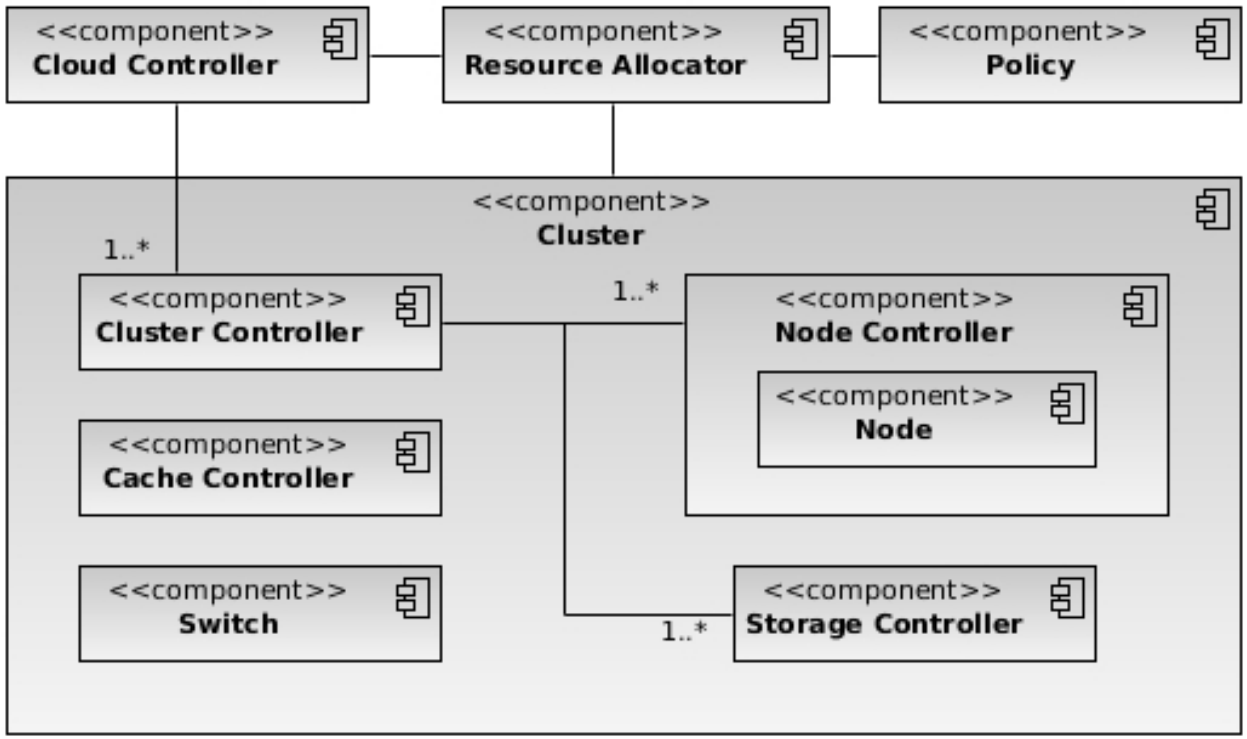
Surprisingly difficult...

- *NP-Complete*
  Simple generalized SLAs are equivalent to *SAT*
- *Multiple Providers*
  Difficult constant factors related to latency, etc.

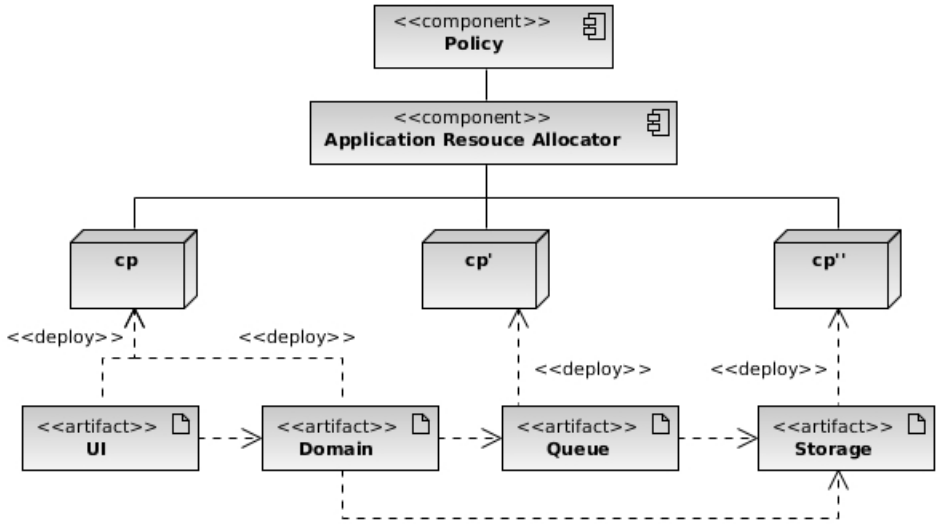
Single Provider, Feedback



Single Provider, Feedback with UM



Multiple Providers



Conclusions