

Ontology-based framework for policy-driven governance in cloud application platforms

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1. BACKGROUND

- Cloud application platforms will revolutionize the development and delivery of software applications
- By design, a cloud application platform is an open environment that is meant to expand over time
- Maintaining platform integrity and reliability in face of continuous expansion is a major challenge for the platform provider
- Definition and enforcement of policies to govern platform processes and artefacts is essential

2. TYPES OF POLICY-DRIVEN GOVERNANCE

- Process governance:
 - The evolution of managed entities must follow an explicitly defined lifecycle model consisting of specific states and transitions, where transitions are guarded by preconditions
 - Example: An app can proceed to beta testing only if there exists an associated QA staff review report with a positive evaluation
- Artefact governance:
 - Artefacts associated with managed entities must conform to all technical or business constraints set by the platform provider
 - Example: The interface specification (WSDL) of every external web service should contain exactly two non-identical endpoint URLs (primary and backup servers for failover)

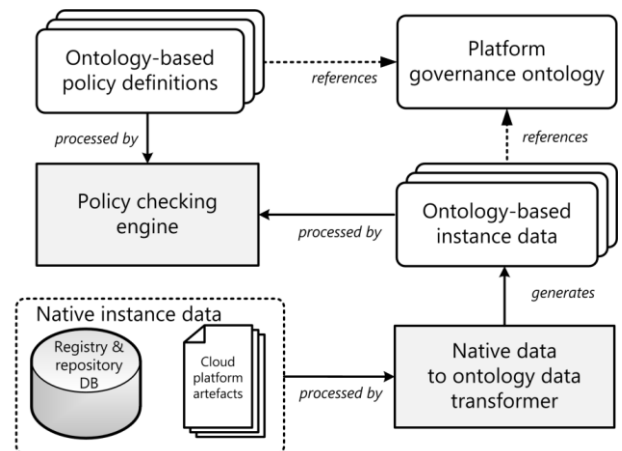
3. PROBLEM DESCRIPTION

- Limitations of policy handling in existing governance tools (registry & repository systems)
 - Lack of proper abstraction: Policy logic is represented at the same level of abstraction as the implementation logic of the R&R system
 - Lack of separation of concerns: Policy definition and enforcement entangled in the same piece of code
 - Lack of formal representation of the relationships among policies and between policies and their subjects (i.e. the logical entities in the domain of governance)
- Implications:
 - Limited policy traceability, maintainability, comprehensibility, verifiability, interoperability, and overall governance agility

4. GOALS & OBJECTIVES

- Main thesis of this PhD research:
 - The limitations of governance technology can be addressed by an ontology-driven approach to defining and enforcing policies
- Objectives:
 - Development of a cloud platform governance ontology and a policy modelling methodology based on our CAST project dataset
 - Development of a policy conformance checking engine supporting alternative methods of policy analysis
 - Definition of a framework architecture enabling integration into various governance registry and repository systems

5. APPROACH OUTLINE



6. RESULTS TO DATE (ONGOING WORK)

- Two alternative strategies for ontology-based policy definition and enforcement:
 - Definition of policies as OWL DL class axioms, data conformance checking via OWL-DL reasoner's instance checking service
 - Definition of policies as SPARQL queries, data conformance checking via query answering
- Present state of cloud platform governance ontology (adopting first strategy):
 - Language: OWL 2; Expressivity: ALCOIQ(D) plus SWRL; Size: 170 classes, 30 properties, 29 individuals (constants), 7 SWRL rules; OWL 2 language features: XSD facets, Keys
- Challenge: standard OWL semantics (Open World Assumption and no Unique Name Assumption); instance data validation achievable through preprocessing step of closure axiom generation