

Requirements and compliance in legal systems: a logic approach

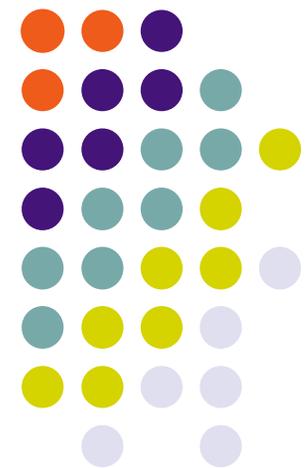


Luigi Logrippo

Université du Québec en Outaouais

Waël Hassan

University of Ottawa



A logic approach?

- Legal systems seen as inference systems
- Axioms \rightarrow Decision
- *Consistency*: only one decision possible
- *Completeness*: decision always possible

Consistency?

- Consistency within a law
- Consistency between different laws and regulations and their implementation

Translating legalese into logic?

- Various levels of logical discourse are used jointly in expressing laws and regulations
- From requirements to implementation
- Some extremes:
 - Hammurabi level = Program or **ECA**:
 - **If any one steals cattle or sheep, or an ass, or a pig or a goat, if it belong to a god or to the court, the thief shall pay thirty fold**
 - Moses level = **Requirements**
 - **Thou shalt not steal = Stealing is forbidden**
 - And other levels in between
 - Also: **Ontology level**, conveys definitions and structure

Use of several styles in legalese

- In PIPEDA (Canadian Privacy Law):
 - *'An organization is responsible for personal information'*
 - *'When an individual expresses a withdrawal of consent, the organization needs to inform the individual of the implications'*
- How to translate the first statement in logic?
- Should the second statement be seen as an 'implementation' of the first?
- Requirement in SOX:
 - *'Approvals cannot be granted to transactions initiated in other departments'*
 - Easily derived implementation: *'if initiator is in different department then deny access to approval action'*

Patterns

- Several are apparent in privacy law:
 - accountability
 - responsibility
 - separation of concerns
 - ...

Ontologies

- Another normative level, orthogonal wrt the two previous ones
- Define the data types and their relations as are used in the law and regulations
 - *'Bank X consists of the following departments:*
 - *Banking, Insurance, Investments, Capital Markets, Global Services'*
 - *'Consent can be received through a signature, a check-off box or verbal ack'*
- Laws may place constraints on enterprise ontologies:
 - *'Financial controllers must report to CEOs'*
 - *'The company's board of directors should include the chief financial officer and internal financial auditor'*
 - *'A chief financial officer should be assigned to the task of selecting an audit firm'*

Ensuring consistency:

- In each normative level
- Across levels

Detecting incompleteness

- As much as possible, within each normative level
 - E.g. for some values of a datatype there is no applicable rule
- Between levels
 - is an obligation stated at a high level completely discharged by implementation rules?
- How to resolve?
 - Human intervention seems necessary

Conformance and compliance

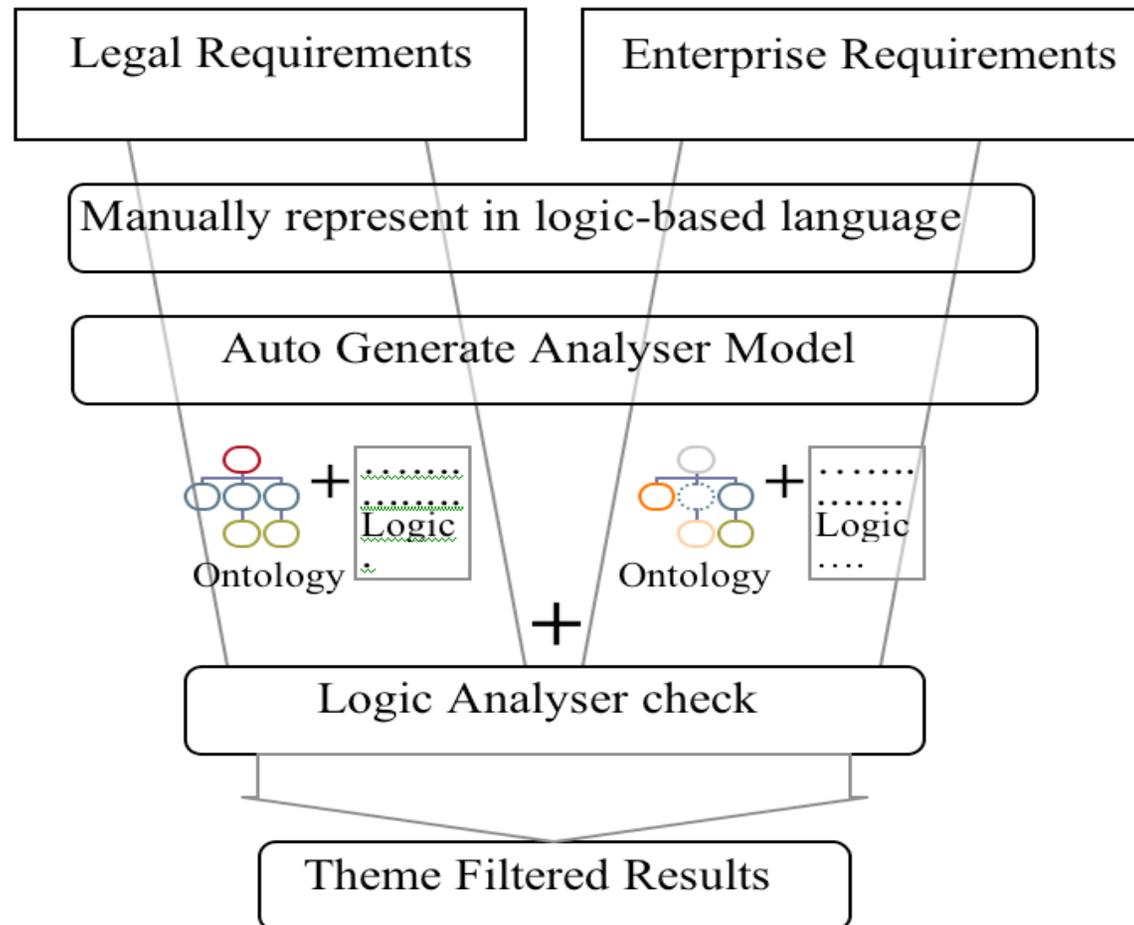
- Conformance is a basic concept in software engineering
 - Compliance = conformance?
- Usually, it is the final **result** that must conform to specifications
 - It must have the specified properties
 - See *black-box testing*
- In many laws however, the **process** has to be compliant too
 - 'Filings' are  **Result**
 - *due at the end of fiscal quarter,*
 - *prepared by the fianance department,*
 - *reviewed by CFO,*
 - *validated by an Audit-Firm, and*
 - *signed by the CFO & CEO, prior to submission*
 - See *grey-box testing*



Process

A language and a tool

- The problem: check mutual consistency between *legal* and *enterprise* req'ts

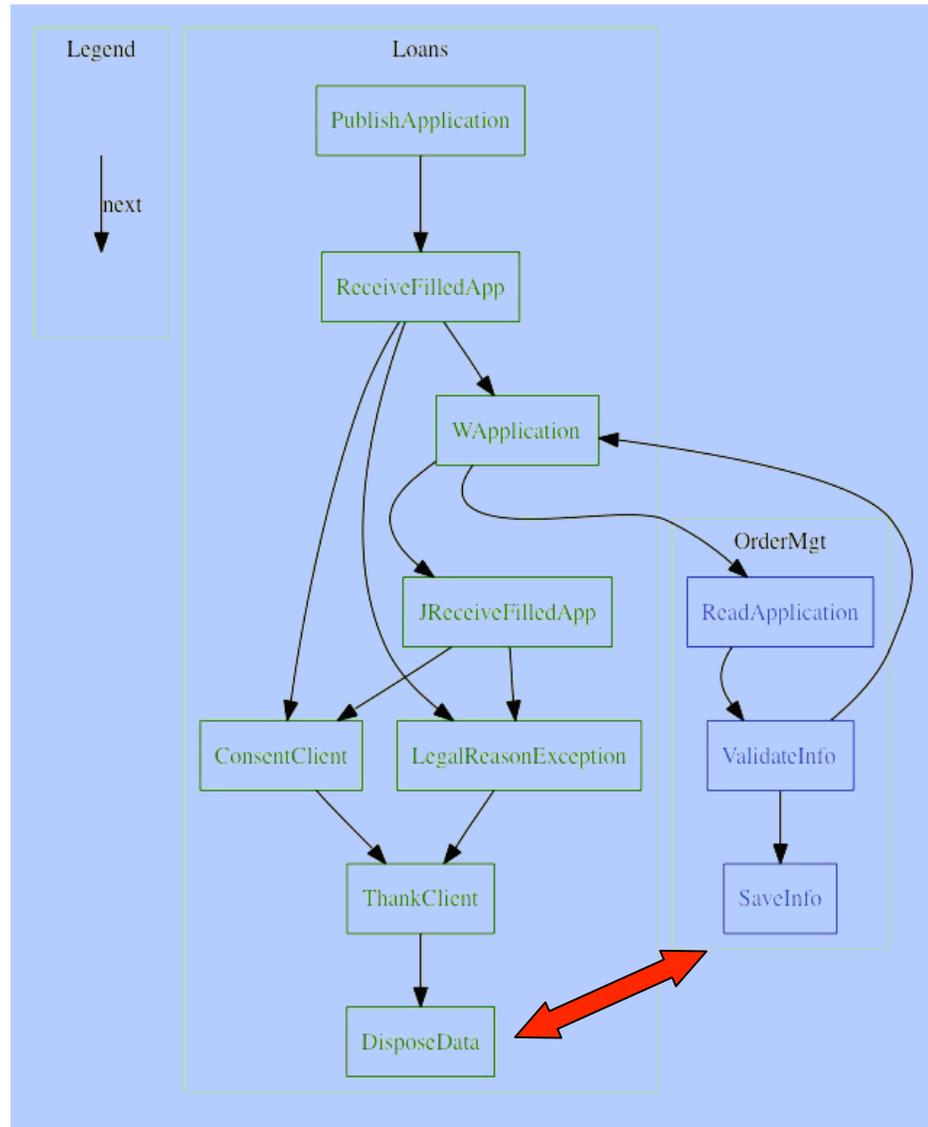


Analyser uses tool Alloy

Sample result: counterexample found

Law specifies disposal of data after end of loan process

However tool discovers that in a company data can be leaked to a department where data is saved



Research questions

- Does logic provide a good perspective?
 - Application to consistency and completeness
- How to translate legal language into logic
 - Separating several intermixed levels of discourse
 - Imperative, declarative, ontological

Relation to SE?

- We have observed similarity with concepts of SE
- As well as usefulness of the same tools
- Can we use SE conformance theory?
- Can we conclude that SE and legal theory have
 - many concepts to share,
 - Many methods to learn from each other?
- Surely it seems to be so in the RELAW area

Related events, related research areas

● JURIX:

- International Conference on Legal Knowledge and Information Systems

● ICAIL:

- International Conference on AI and Law

● DEON:

- International Conference on Deontic Logic in Computer Science

● NorMAS:

- International Workshop on Normative Multiagent Systems