Consent-based Electronic Patient Information Exchange

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Ontario Personal Health Information Protection Act (PHIPA) – 2004
- defines rules that "health information custodians" must follow when collecting, using and sharing personal health information

Consent is a complex problem
- representation, management, and enforcement (application & validation)
- institutional privacy & security policies provide additional complexity

Motivation

Semantic knowledge inference allows for automated machine-based processing of information sharing across heterogeneous systems facilitates modelling patient consent and other policies allows for automated machine-based processing of policies

Semantic knowledge inference
- policies can be reasoned with
- inference of knowledge (explicit & implicit)

Multi-Agent systems (MAS)
- model healthcare entities as intelligent agents
- model healthcare institutions as MAS

Building Blocks

Artificial Intelligence
- structured knowledge representation
- knowledge sharing
- knowledge inference

Semantic Web
- resource description language
- OWL
- semantic reasoners

Privacy & Security
- multi-party trust establishment
- policy-based access control

Example: Semantic Access Control

knowledge store
- HIV_MR : a MedicalRecord; belongsTo : John.
- DrSmith : a Physician; inTreatment : John.

inference rule

query
- WHO hasAccess HIV_MR.

proof
- [John HasPolicy optin; HIV_MR belongsTo John; DrSmith inTreatment John] evidence KNOWLEDGEBASE 2.

result
- [DrSmith hasAccess HIV_MR & evidence evidence 2.]

System Components

An information exchange framework
- supporting distributed heterogeneous health information systems
- focusing on consent along with other privacy & security policies
- creating electronic consent models (representation)
- providing access control decision making (enforcement)
- auditing for all system-made decisions (validation)

Our Vision

Semantic Consent Model

Institutional MAS Model

3 Phase protocol
- provides consent enforcement before any information is exchanged
- first order logical proof - provides auditing capabilities - provides confidence in the result

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