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Role of Ontological Semantics in Handling Privacy Policies

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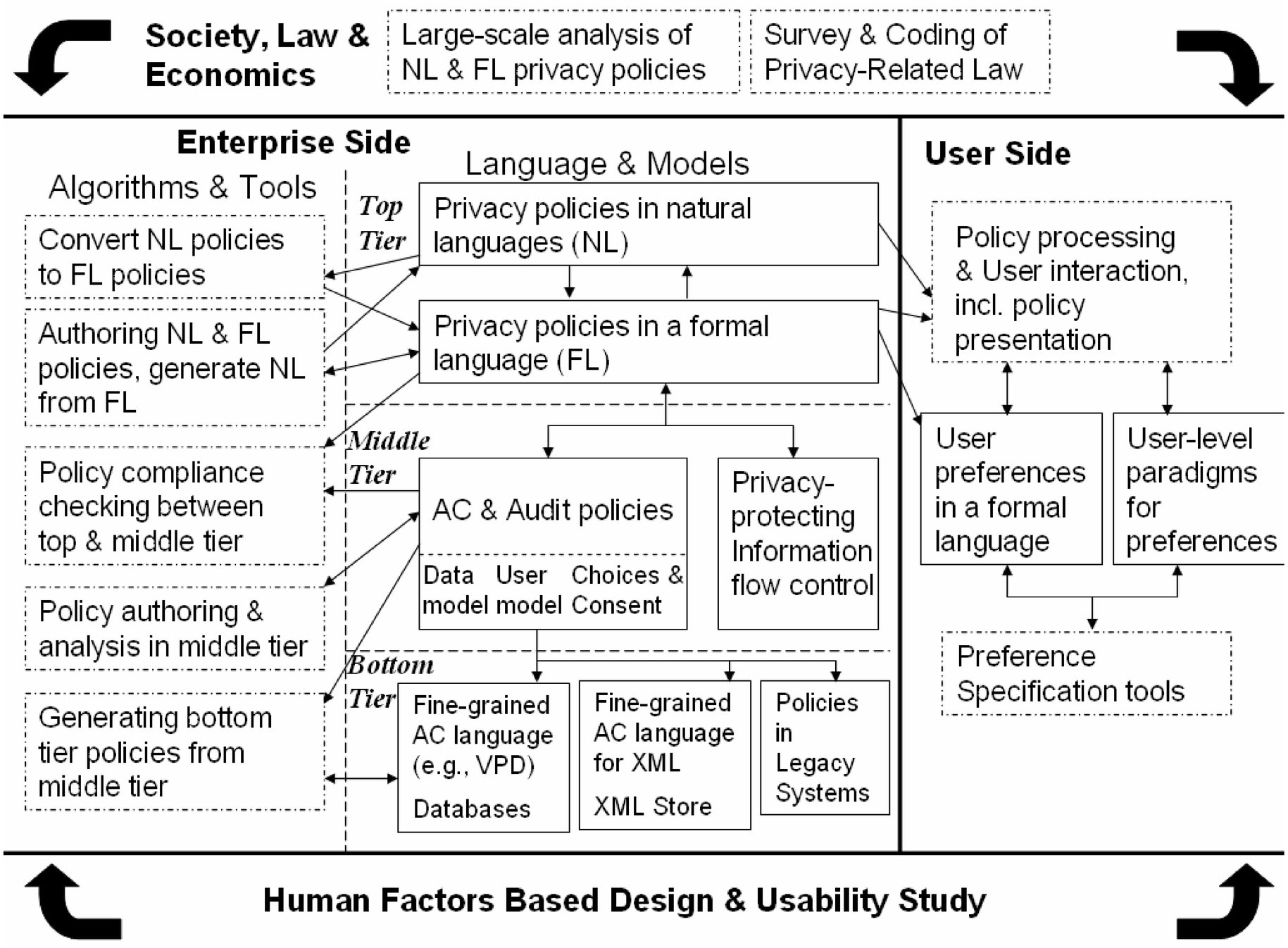
Understanding privacy policy (PP) is a key to prevent unsolicited marketing and disclosure of personal information. PP is written in natural language, hence need for a tool to convert natural language into formal machine language.

Current solutions	**Limitations**
- disable cookies	- restricted transactions
- P3P	- no validation of one's policy in machine-language format is consistent with original;
	- excludes web-sites that while don't comply, may have privacy practices exceeding those of P3P;
	- lacks means to enforce privacy policies;

CyberTrust Project aims at creating an innovative system with following results:

- An expressive language for specifying PP that has an intuitive and precise semantics based on a rich ontological resource;
- An advanced framework for authoring, enforcing and auditing PP;
- Tools to empower users with control of their PP through user-friendly and ontology-based interfaces;
- Tools for evaluating today's privacy practices;

(CyberTrust proposal, 2004)



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NLP: Ontological Semantics Approach

- ontology is the constructed-reality conceptual hierarchy of the domain, relating all the processes, objects and properties in it;
- the lexicon contains all the words and phrases of the domain, with their meanings defined in ontological terms;
- the processed sentence is expressed as a text meaning representation (TMR) in the formal ontology-based TMR knowledge representation language;
- analyzer takes the input sentence to its TMR, while the generator reverses the process; (CyberTrust proposal, 2004)

PP: Outline of Ontological Mapping

First Party (company)
information-collect
customer-provided
personal information
customer-not-provided
click-stream information
information-use
provide-service
disclose
third party
marketing
solicit
marketing
web-site
advertise
user-interaction
chat-room
forum

Concept

```
(INFORMATION-SECURITY-ATTACK
   (DEFINTION (VALUE "the attempt to obtain,
                      alter or erase information"))
   (IS-A (VALUE (COMMUNICATIVE-EVENT
                      CRIMINAL-ACTIVITY)))
   (SUBCALSSES (VALUE
                      COMMUNICATION-OBSTRUCT
                      INFORMATION-ERASE
                      INFORMATION MODIFY
                      INFORMATIONOBTAIN))
   (AGENT (SEM INFORMATION-SECURITY-
                      ATTACKER))
   (BENEFICIARY (SEM HUMAN))
   (INSTRUMENT (SEM COMMUNICATION-DEVICE
                      NATURAL LANGUAGE))
   (THEME (SEM INFORMATION))
   (LEGALITY-ATTRIBUTE (VALUE NO))
   (OPPOSITE (SEM SOCIAL-EVENT)))
```

Lexical Entry

```
(INTERFACE
  (INTERFACE-N1 (CAT N)
  (ANNO (DEF "point of connection between two
                systems, networks, or devices")
        (EX "")(COMMENTS ""))
(SYN-STRUC ((N ((ROOT $VAR1)
                (CAT N)(POSSESSIVE +) (OPT +)))
                (ROOT $VAR0) (CAT N)
                (PP-ADJUNCT (( ROOT WITH)
                (ROOT $VAR2) (CAT PREP)
                (OPT +) (OBJ
                ((ROOT $VAR3)(CAT N)))))))
(SEM-STRUC  (RELATION (DOMAIN (VALUE ^$VAR1))
                (RANGE (VALUE ^$VAR3)))
                (^$VAR2 (NULL-SEM+ )))))
```

```
(INTERFACE-V1 (CAT V)
   (ANNO (DEF "connect two otherwise possibly not    communicating
                devices")
         (EX "") (COMMENTS ""))
(SYN-STRUC ((ROOT $VAR0) (CAT V)
                (SUBJECT((ROOT $VAR1) (NP CASE NOMINATIVE)))
                (DIRECTOBJECT ((ROOT $VAR2) (CAT N)
                                (NP CASE ACCUSATIVE)))
                (PP-ADJUNCT ((ROOT WITH) (CAT PREP)
                                (OBJ ((ROOT $VAR3)))))))
(SEM-STRUC (CONNECTS (DOMAIN (VALUE ^$VAR1))
                                (RANGE (VALUE ^$VAR2))))))
```

Reference: A. Anton, D. Baumer, E. Bertino, M. Dark, N. Li, R. Proctor, M. Rappa, V. Raskin, K. Vu, T. Yu, **CyberTrust Proposal**, 2004.