Knowledge Engineering Tools and Semantic Translation

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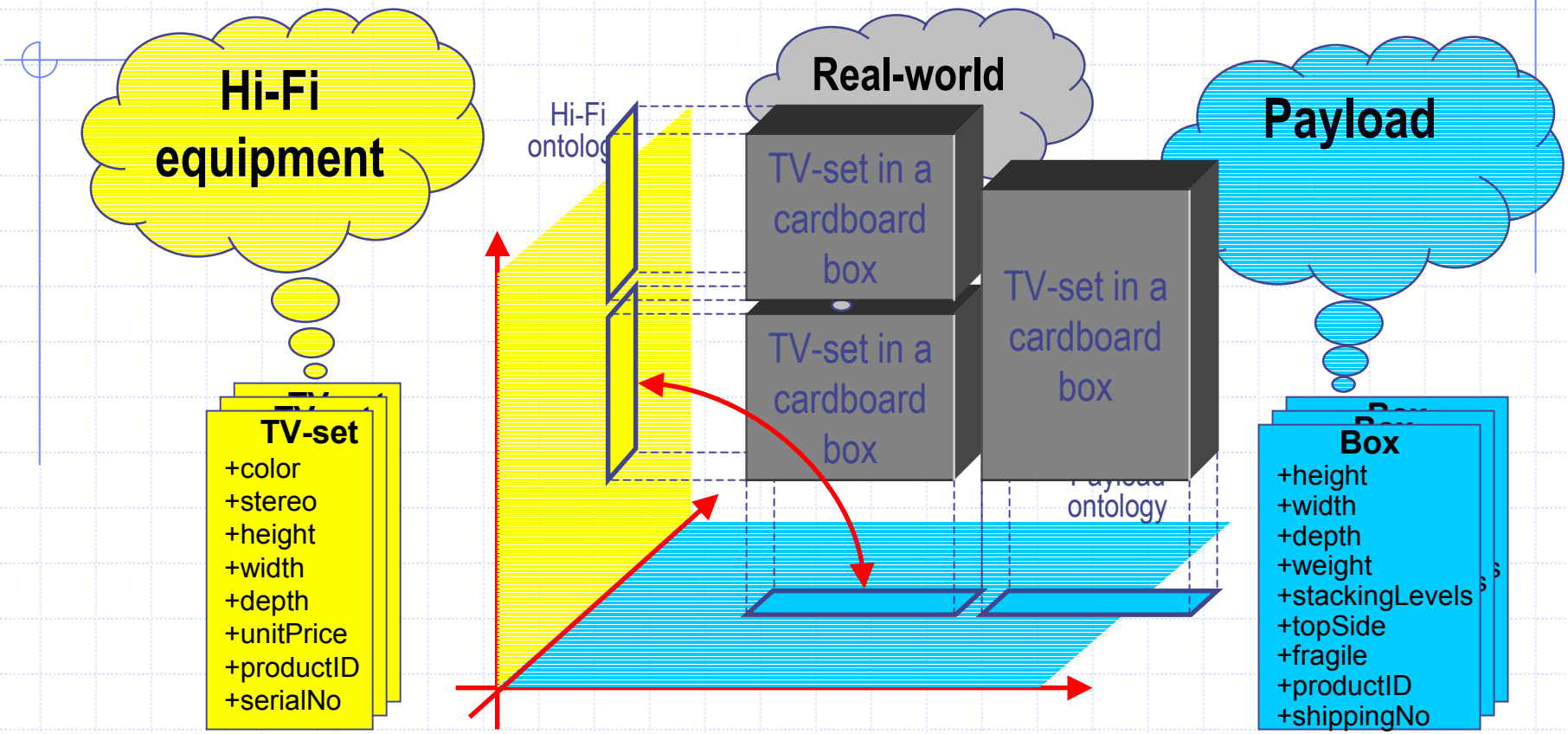
Knowledge Engineering Tools

- Ontology Engineering (OE)
  - Ontology creation, editing, comparing ...
- Knowledge Acquisition (KA)
  - From human experts
  - From machine-readable sources
- Automated Reasoning (AR)
  - Inference
  - Verification
- Often support multiple aspects

Semantic Translation and ontologies



- Ontologies
  - Shared conceptualization of a domain, "consensus view"
  - Semantic content limited to the domain of interest
- Approximate re-classification
  - Semantic enrichment (needed for disambiguation)
  - Upper-level ontologies (shared vocabularies)

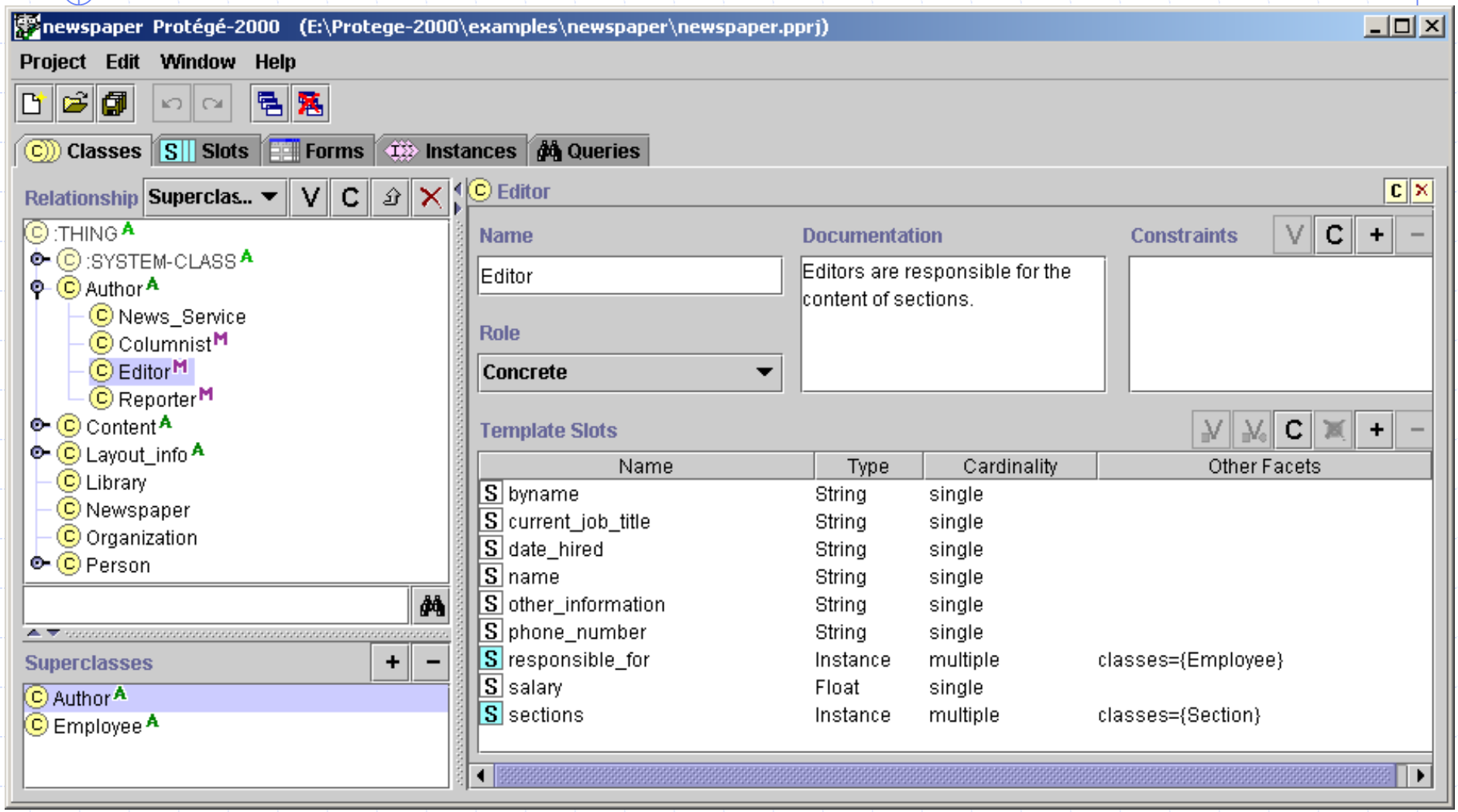
Why KE Tools for ST?

- ST relies on the use of ontologies
  - Efficient ontology management needed
- Shared ontology design
  - Efficient ontology design support needed
- Validation and inference
  - Consistency checking and discovering non-obvious relations are crucial
- KE is a widely-researched topic
  - There are many supporting tools and models
  - BUT few of them support ontology mapping

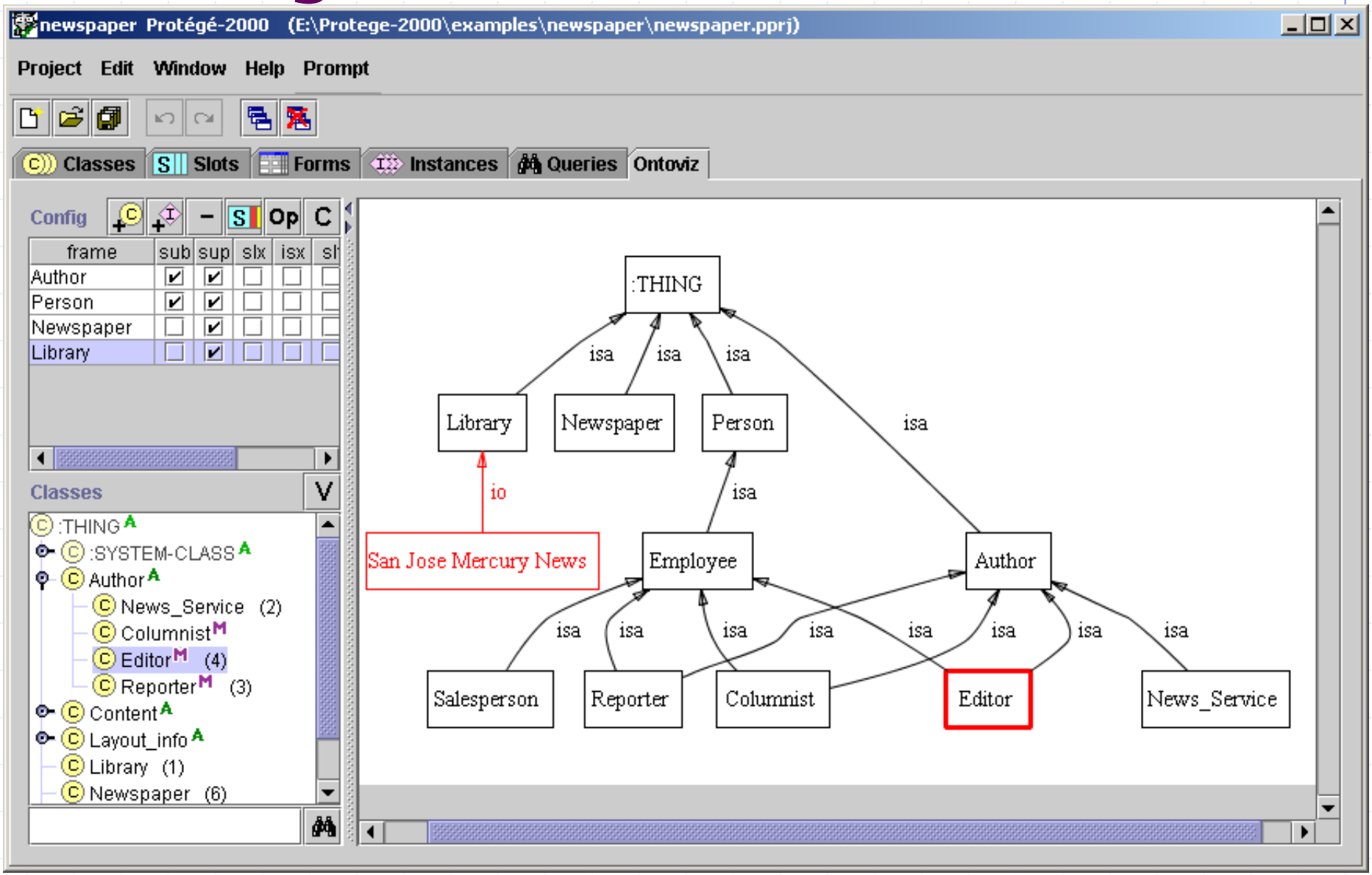
Protégé 2000

- Features: OE, KA, AR
- Knowledge model: frame-based
  - Class, slot
  - Multiple inheritance
  - Template slots
- Modular and extensible
  - Plug-in system, with multitude of modules available (KA, inference, merging, WordNet…)
- Open Source (MPL)

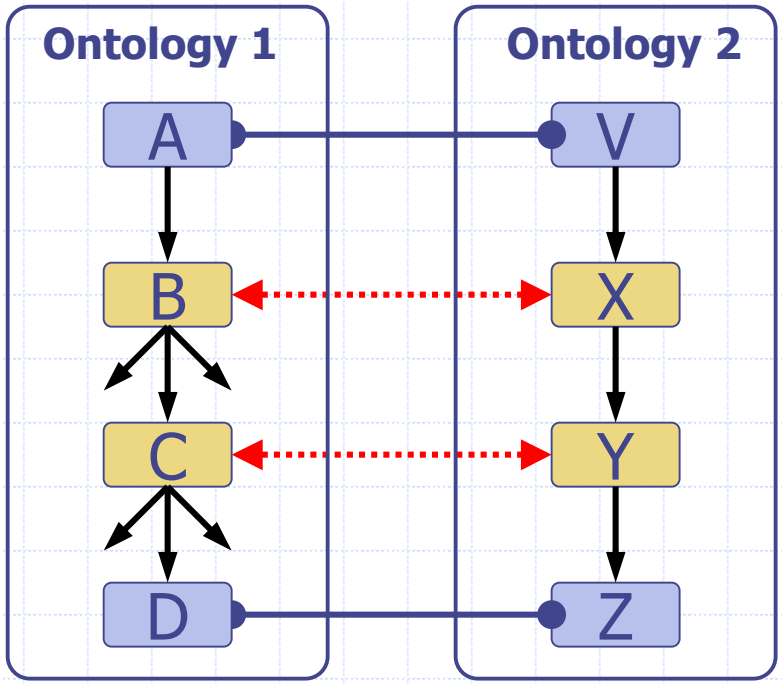
Protégé Interface: Classes, slots



Protégé Interface: OntoViz



Anchor-PROMPT: semantic matching

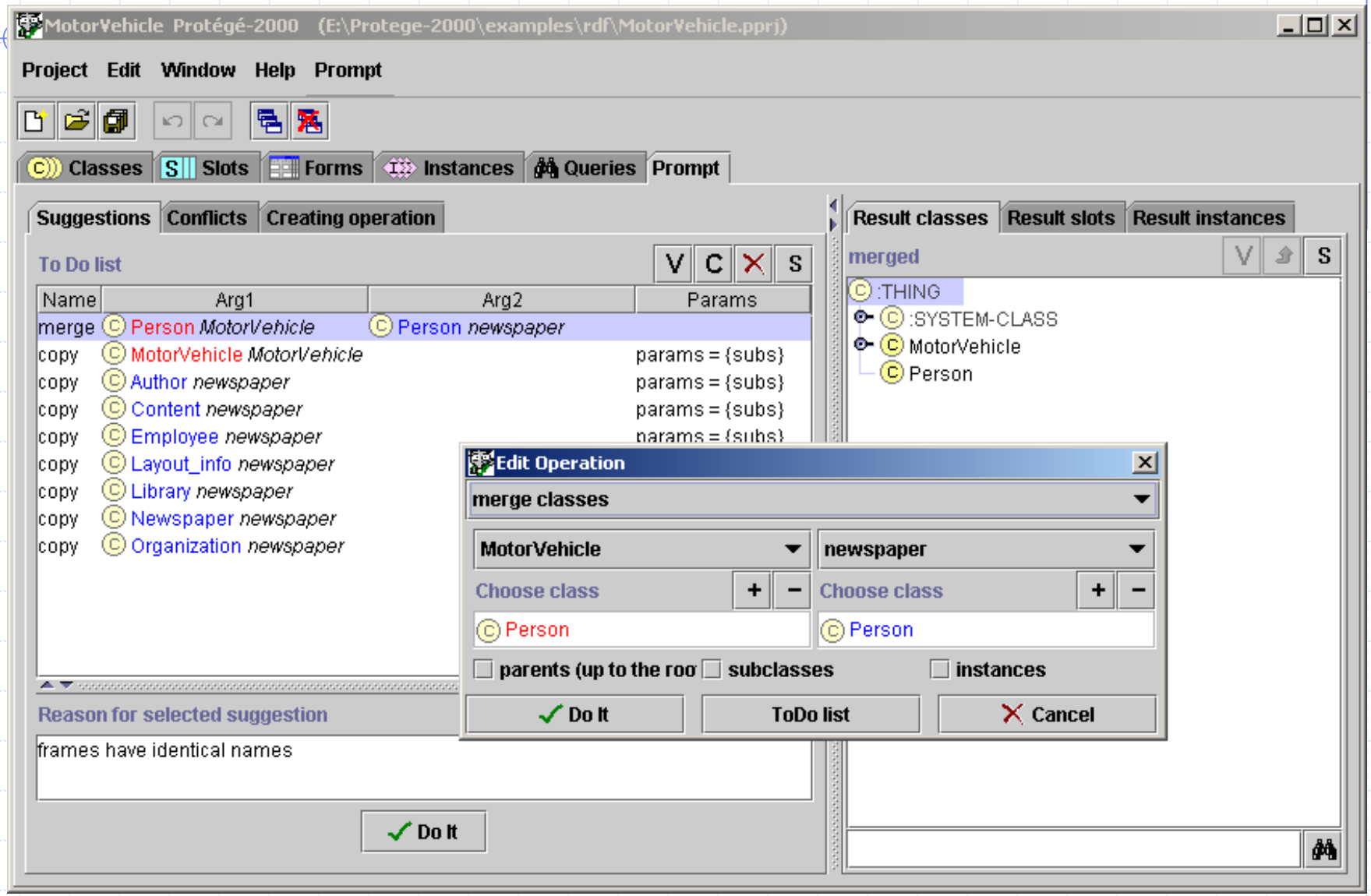


- Requires providing pairs of anchors
  - These can also be suggested based on heuristics (e.g. lexicographical similarity)
- Suggests matching terms by analyzing non-local context
  - Tests have shown ca. 60% correct guesses

Anchor-PROMPT: e-commerce scenario

- Two ontologies
  - O1: some well-known standard (e.g. ebXML)
  - O2: simple general ledger database tables
    - Tables -> classes
    - Fields -> slots
- User with limited ontology knowledge (typical for SME)
  - User can provide the most obvious matches
    - E.g. O1(Person) -> O2(Person)
  - Anchor-PROMPT suggests less obvious matches
    - E.g. O1(Address) -> O2(Location)
- Current implementation:
  - Only earlier version available (plain PROMPT)
  - Only ontology merging or sub-selecting, not mapping

Protégé Interface: PROMPT



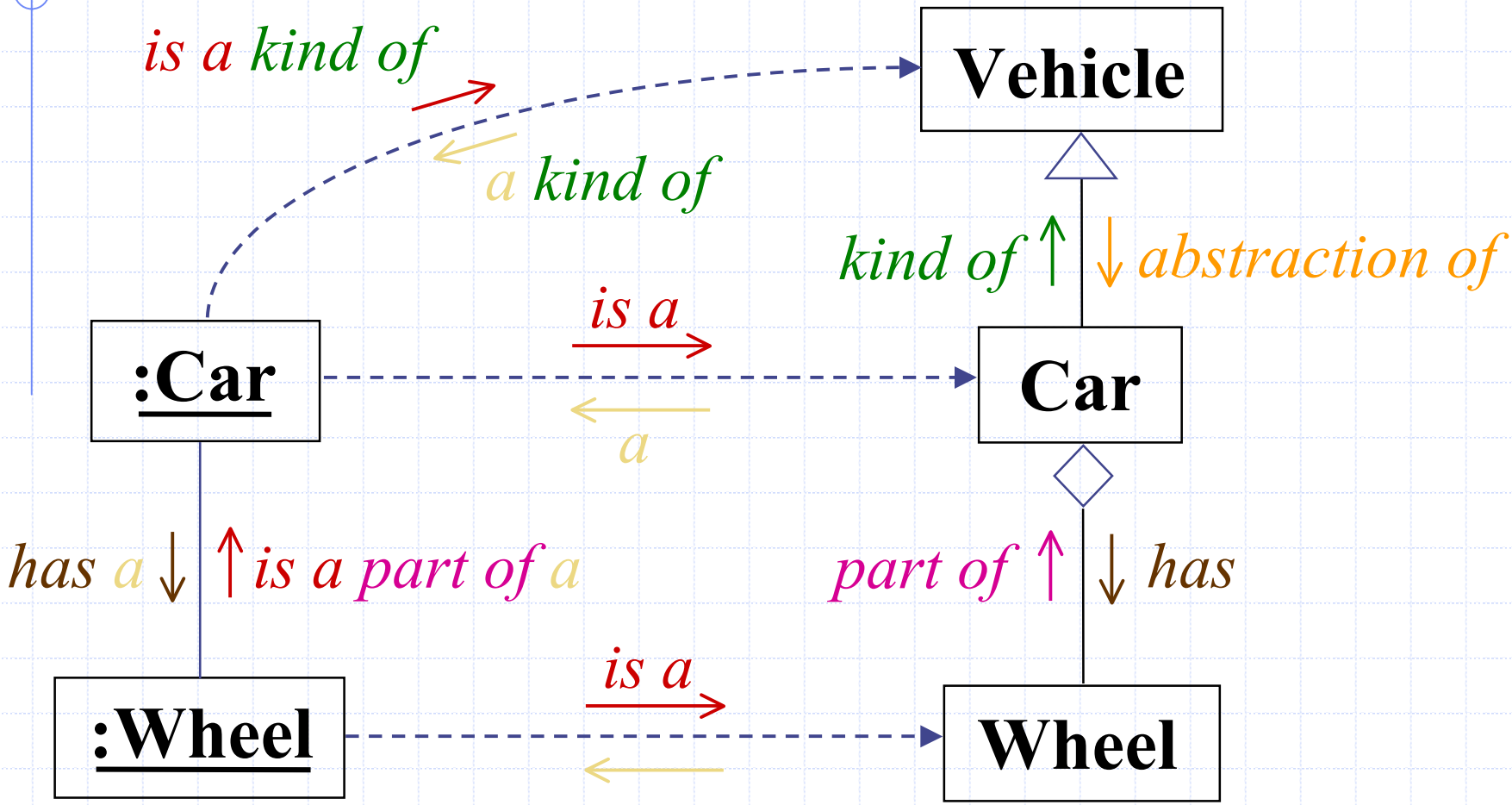
Protégé Summary

- Very flexible and extensible
- Cross-platform, open source (MPL)
- Rich functionality
- Extensive API for model management
- Explicit support for semantic matching
- BUT: the knowledge model is difficult for non-experts
  - This could be hidden behind a special-purpose user interface module

Conzilla Concept Browser

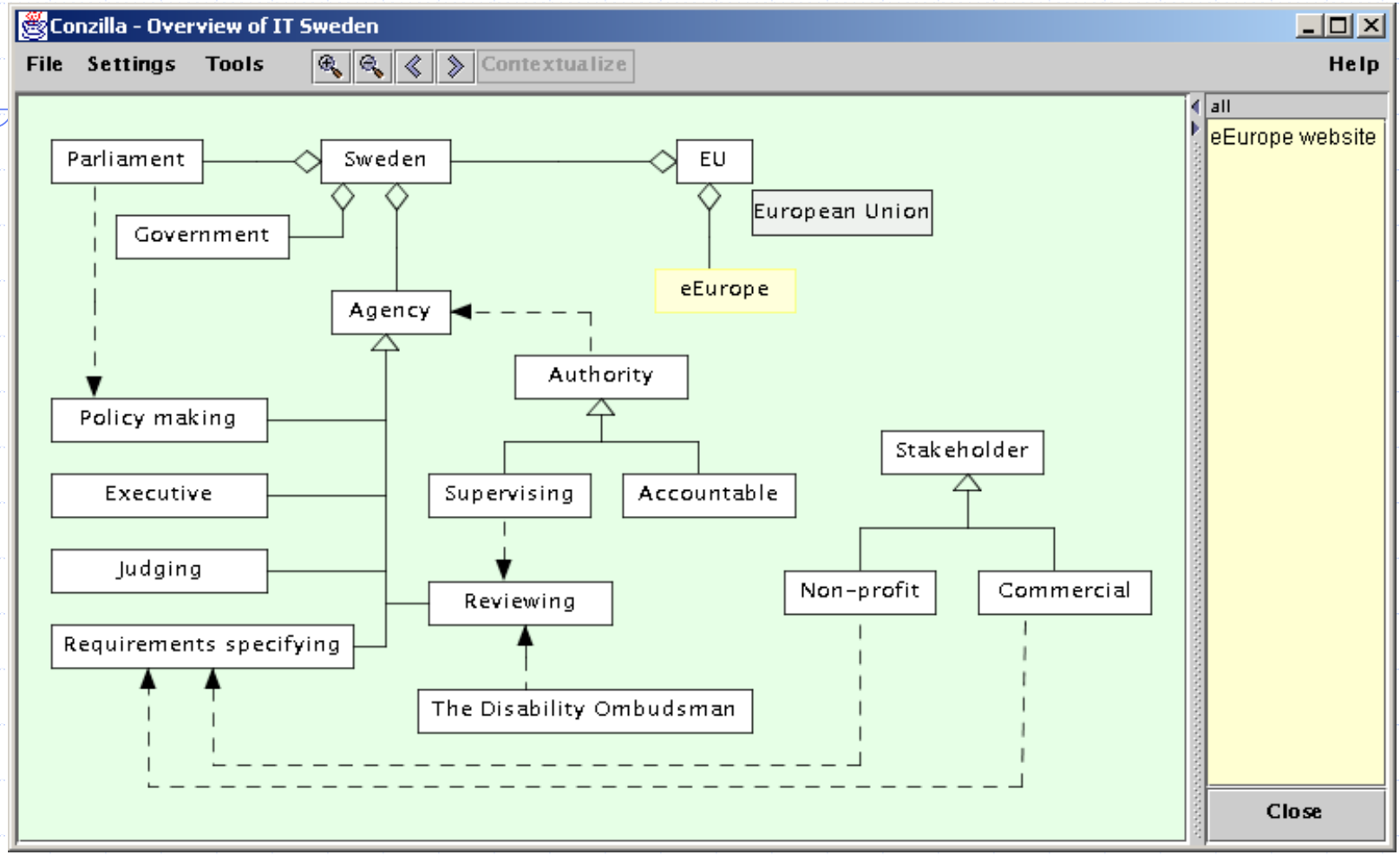
- Features: OE, KA
- Cross platform, open source (GPL/MPL)
- Knowledge model: "neurons"
  - Associated with multilingual meta-data
  - Neuron types:
    - Class
    - Specialization (subclass-of [= isa in KE])
    - Association (related-to)
    - Aggregation (part-of)
    - Instantiation (is-a [≠ isa in KE!])

Conzilla Unified Language Modeling



- A UML profile, readable in natural language
- More precise and concise than traditional KE notation (isa, instanceOf)

Conzilla Interface



- Easily converted to/from natural language
- Easily accessible meta-data (multi-lingual)
- Easily accessible content
- Understandable for both business and technical people

Conzilla Summary

- Unique context navigation
  - Helps to keep track of the concept relationships
- UML profile for diagrams
  - UML is well-understood for a wider audience
  - ULM - diagrams easily converted to/from natural language
- BUT:
  - Currently uses its own XML format (RDF in works)
  - Difficult content editing

Conclusions: Protégé/Conzilla/PROMPT

- Conzilla as a Protégé plug-in:
  - Adds a non-expert interface to the KB
  - Easier to understand graph. visualization of the ontology
  - Ontology can be exported to many formats
  - All other Protégé plug-ins become available for additional processing
  - Advanced Protégé interface available for experts
- Anchor-PROMPT can help less experienced users
- All code is under open source license (MPL)

Further information

- Protégé website
  - http://protege.stanford.edu
- Anchor-PROMPT
  - *Anchor-PROMPT: Using Non-Local Context for Semantic Matching,* N.F. Noy, M.A. Musen, Aug 2001
- Conzilla
  - http://www.conzilla.org
- ECIMF Project Information Center
  - http://www.ecimf.org