

An argumentation workflow for reasoning in Ontology Based Data Access

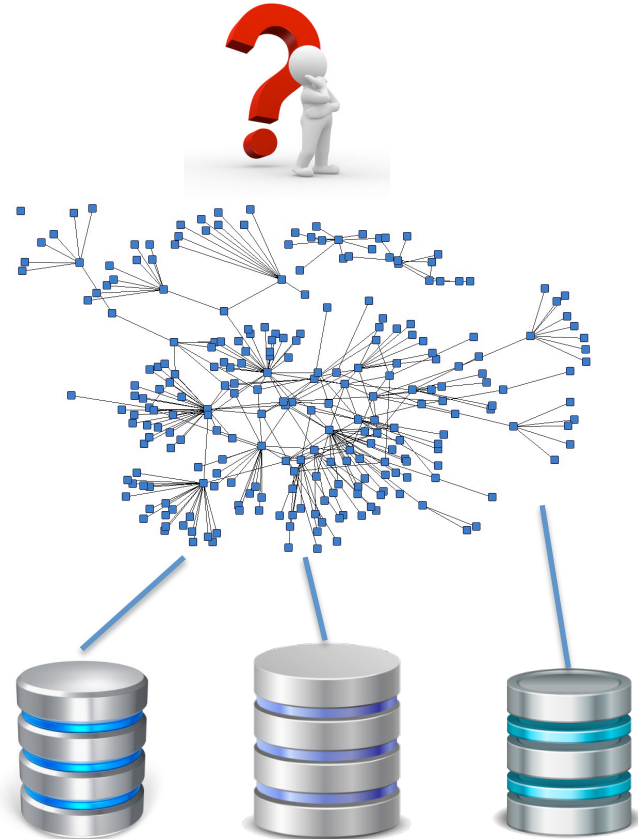
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What is Ontology Based Data Access

- Powerful paradigm that **abstracts the access** to data sources (databases usually) via an ontology:
 - Extra information because the ontology allows for inference on new facts from the databases
 - Unifying independently developed databases under the same ontological vocabulary



In this paper

- We place ourselves in the OBDA paradigm
 - **Data-sources** are expressed as relational databases (thus n-ary predicates) called facts **(F)**.
 - The **ontology** expressed in Datalog+ (rules allowing for existential quantified variables in the conclusion) called rules **(R)**.
 - **Negation / inconsistency** between facts expressed as integrity constraints called negative constraints **(N)**.

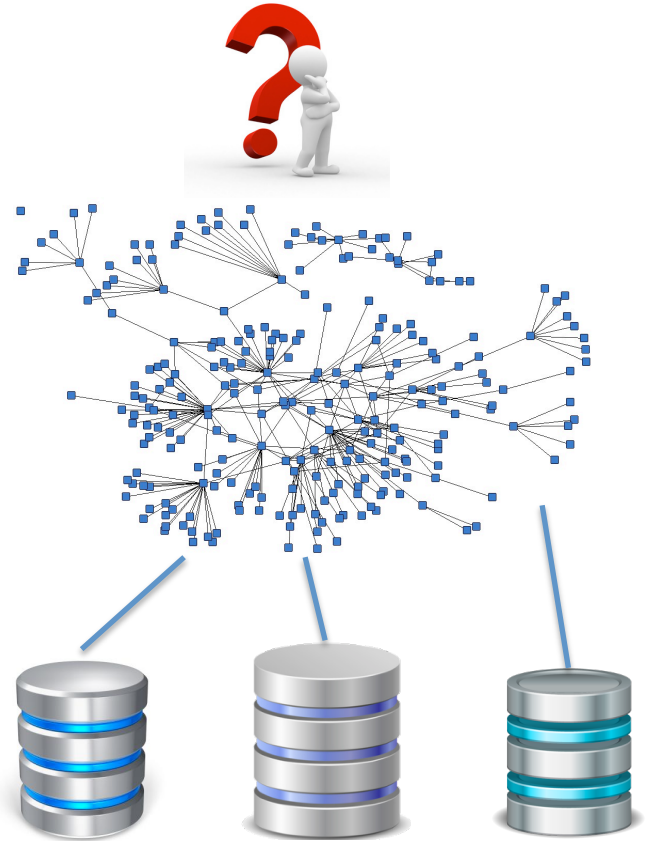
Example

- A knowledge base F, R, N:
 - F:
 - Cat(Tom);
 - Dog(Tom);
 - R:
 - all cats are animals;
 - all cats have mothers that are cats;
 - ($\forall x (\text{cat}(x) \rightarrow \text{\textcolor{red}{\exists}} y \text{ cat}(y) \text{ and mother_Of}(y,x))$);
 - N:
 - One cannot be a cat and a dog at the same time;
 - ($\forall x (\text{cat}(x) \text{ and dog}(x) \rightarrow \text{\textcolor{red}{\bot}})$).

Ontology Based Data Access

Assumptions

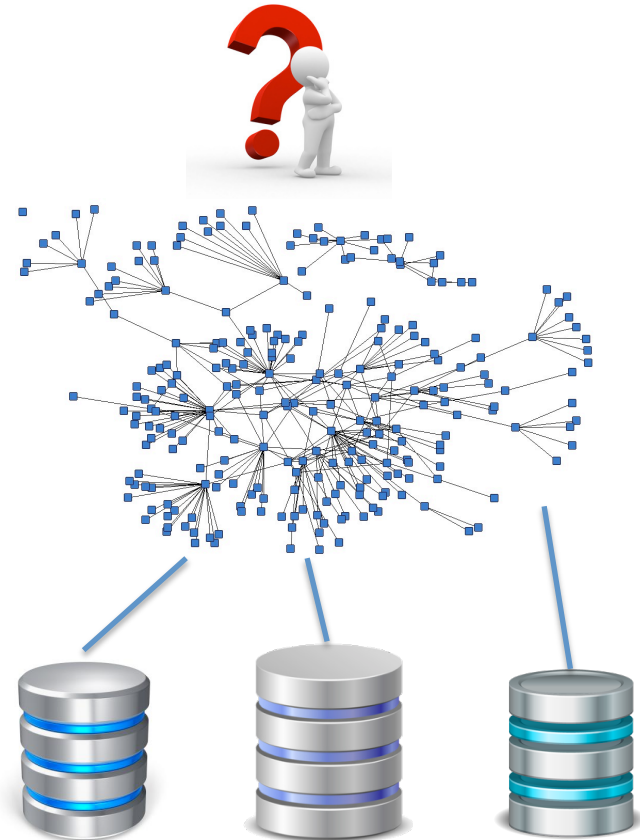
- The **ontology** is **coherent** (it has a model) (being a common effort of several ontology experts).
- **Inconsistency** arises from facts.



Ontology Based Data Access

Inconsistency Handling

- Construct **repairs of the union of all facts**: maximally consistent subsets
- Reason over the repairs eventually enriched by the ontology using **“inconsistency tolerant semantics”**



Existing equivalences results

- Croitoru, M. and Vesic, S.: *What Can Argumentation Do for Inconsistent Ontology Query Answering?* SUM 2013
 - Repairs are equivalent to extensions obtained from an AF where arguments defined as a sequence of facts obtained by successive rule applications.
- Croitoru, M. and Vesic, S.: *Introducing Preference-Based Argumentation to Inconsistent Ontological Knowledge Bases.* PRIMA 2015
 - Extending SUM 2013 results to preferences defined over extensions and equivalences with sub-preferred theories.

This paper

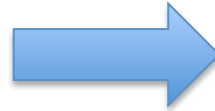
- Investigate an ASPIC+ instantiation for OBDA setting in Datalog+
- Investigate how tools for ASPIC+ could provide a practical way of reasoning with inconsistent tolerant semantics

ASPIC+ Instantiation Basics

- A knowledge base F, R, N:
 - F:
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 - Dog(Tom);
 - R:
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 - all cats have mothers that are cats;

(\forall x (cat(x) -> \exists y
cat(y) and mother_Of(y,x));
 - N:
 - One cannot be a cat and a dog at the same time;

(\forall x (cat(x) and dog(x) ->
\bot)).



-We restrict to the Datalog+- fragment (tractability)

-cf based on N

-facts transformed into defeasable rules
(\emptyset => cat(Tom))

-rules are strict rules

ASPIC+ Instantiation Results

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 - Dog(Tom);

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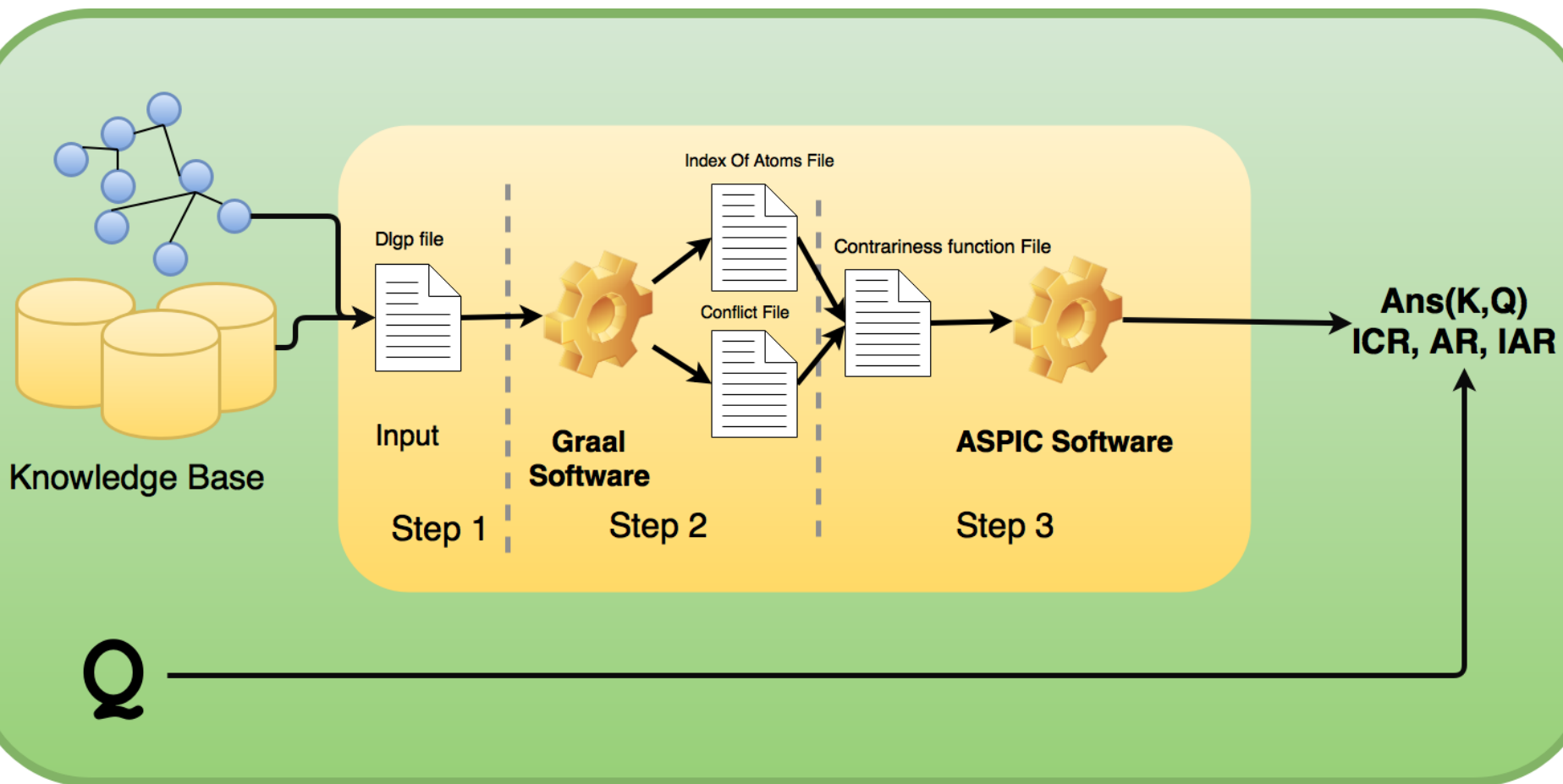
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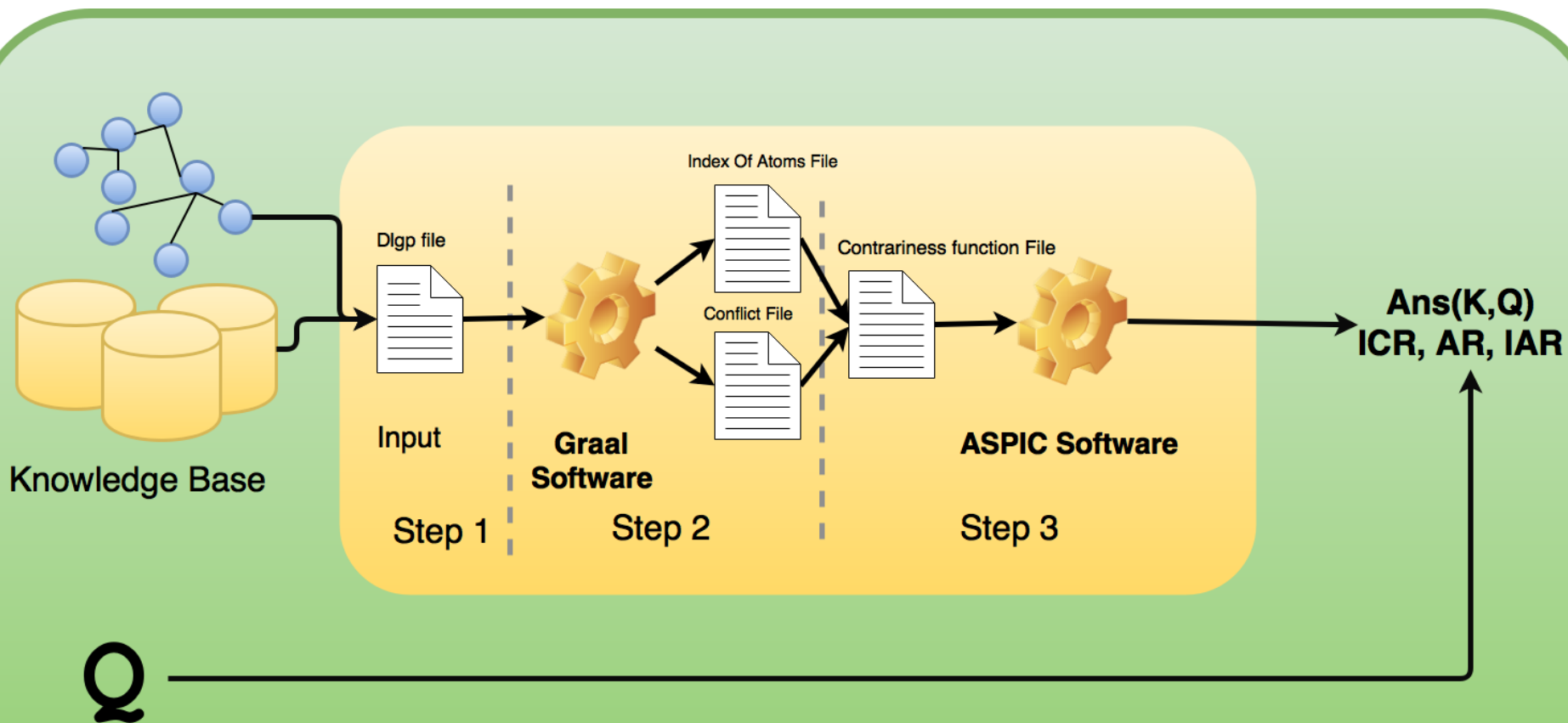
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REPAIRS ARE EQUIVALENT TO EXTENTIONS

Proposed Implementation Workflow



Proposed Implementation Workflow



Implementation difficult due to a lack of fully functional ASPIC software

Thank you for your attention

For any questions please contact M. Croitoru
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