API4KB

Proposals and Challenges

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Acknowledgments

- API4KB Initiative early participants:
  - Roy Bell
  - Roger Burkhart
  - Harold Boley
  - Adrian Giurca
  - Elisa Kendall
  - James Odell
  - Adrian Paschke
  - Harold Solbrig

So far, 50+ people have shown interest and provided feedback

- …. **You** ?

Part I

Hybrid Knowledge Bases

Hybrid Knowledge Bases

”**Knowledge**” in a broad sense

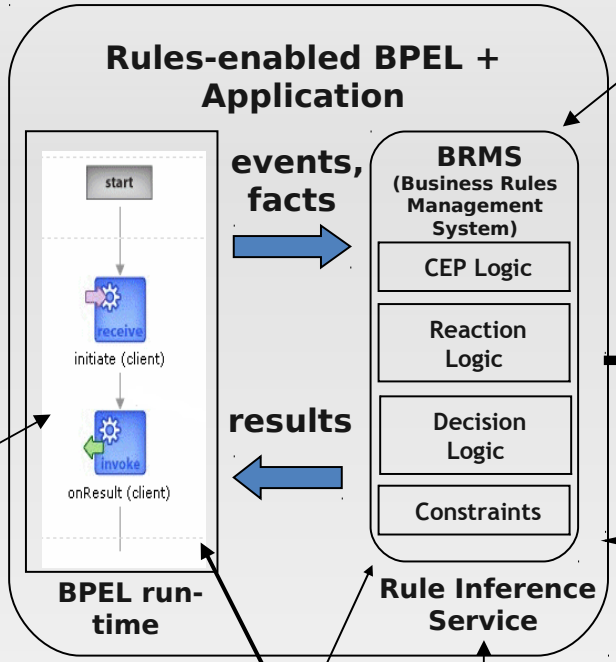
- Declarative ~~vs~~ *plus* Operational
- Qualitative ~~vs~~ *plus* Quantitative

- Knowledge
  - Concepts/Relations
  - Rules
  - Processes
  - Predictive Models
  - ...
- Data
  - Individuals (A-box)
  - Facts
  - Traces
  - Data Sets
  - ...

Example : Semantic BPM in Prova

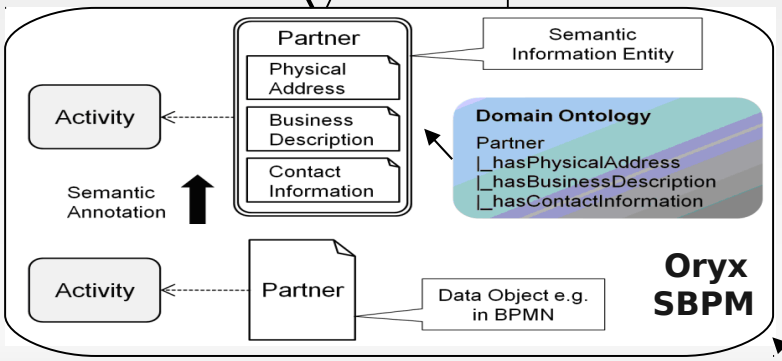
3. RuleML Rule Responder (PIM)

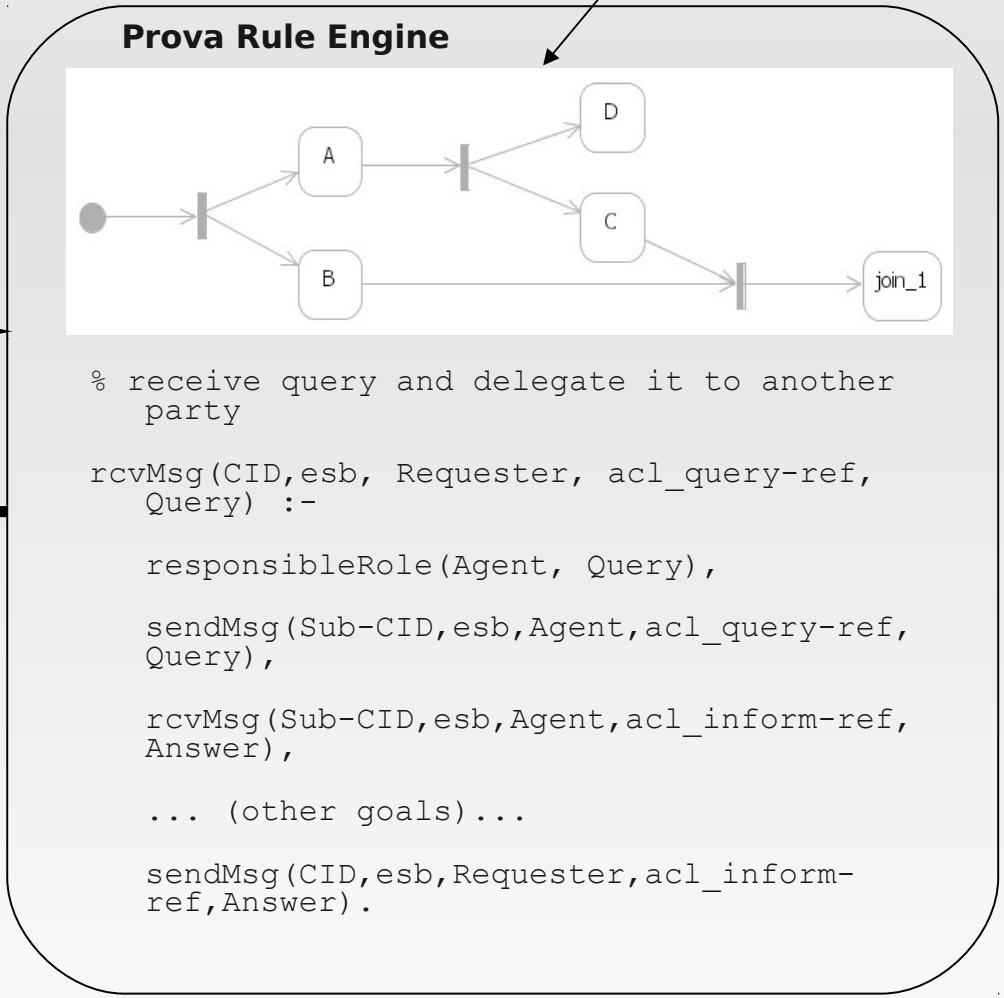
4. Prova Rule Engine (PSM)



2. BPEL (PIM)

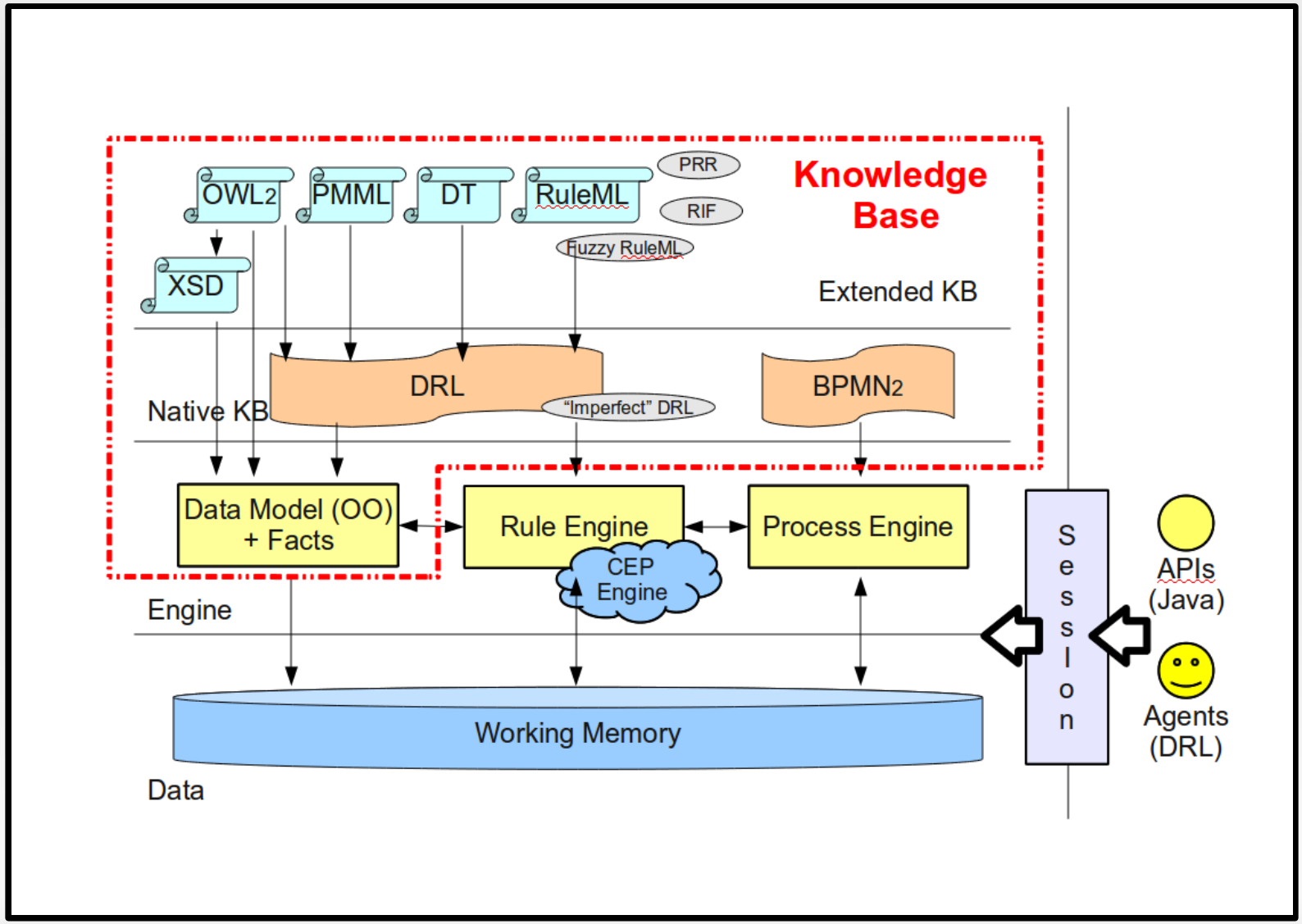
SBPMN -> BPEL+





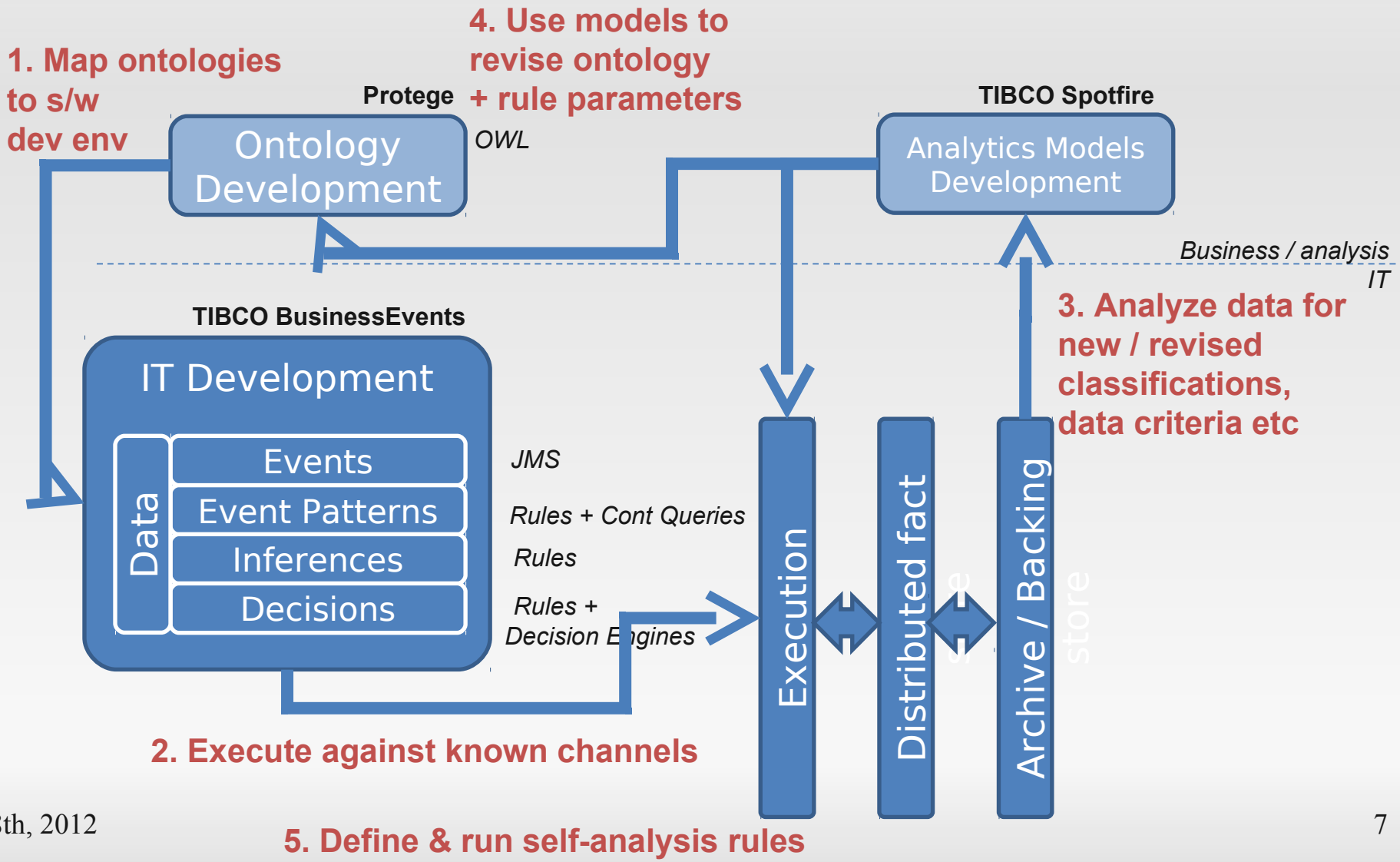
1. OMG BPMN (+ Semantics) (CIM)

Example : Hybrid Knowledge Bases in Jboss Drools



Example : Semantic Event Processing in Government

Courtesy of Paul Vincent (Tibco)



Part II

Use Cases

API4KB Use Cases / 1

- **Clinical Decision Support Systems**
  - Inspired by Health e-Decision Standardization Initiative
    http://wiki.siframework.org/Health+eDecisions+Homepage

- The National Health Coordinator expects a **uniform application of clinical guidelines** to be applied by the different, local healthcare providers running Clinical Decision Support Systems
- Clinical guidelines might be expressed as rules, processes, or a combination thereof
  - Usually include predictive models and/or semantic classifications
- Local knowledge bases will need to be updated
  - The new artifact will integrate with existing rules/processes
- The data, kept by the local providers, may be using different formats
- Many actors would query/invoke the (updated) knowledge base

API4KB Use Cases / 2

- **Environmental Decision Support Systems**
  - Inspired by a project from the Italian National Agency for New Technologies, Energy and Sustainable Economic Development (ENEA)
  - Similar initiatives in Spain (http://www.novedar.com) and USA (http://www.ifossf.org)

- Water Treatment Plants require continuous monitoring and control. They are being equipped with sensors, generating data which must be processed in (soft) real time for decision support
  - The automation modules installed on the plants submit data to a remote, loosely coupled knowledge-based service to be analysed
  - The remote EDSS can generate commands and send them back to the plant
  - The data must also be delivered to a (decoupled) monitoring system which verifies the legal aspects

API4KB Use Cases / 3

- **Legal Decision Support Systems**
  - Inspired by the LegalRuleML initiative

- The norms and principles that regulates many contexts (from Web applications to daily life) derive from legal texts, whose interpretation is often discretional
  - Judgments provide information about arguments and interpretations in concrete, reference cases…
  - … but they are subject to variations in time and context

- Legal ”reasoning” requires non-monotonic (defeasible and deontic) temporal inference, over concepts defined in appropriate ontologies, with argumentation and metadata reference to external knowledge sources.

Part III

API4KB

API4KB

- Knowledge Artifacts are becoming more easily available
- Hybrid Knowledge Bases allow to combine them
- Hybrid Engines make use of that Knowledge
  - Provide distributed reasoning capabilities
  - World-wide infrastructure for intelligent agents

Problem:

- How can a “third party” make use of this?
  - Without making assumptions on the content of the KB !
  - Without making assumptions on the inference processes !

API4KB : Related Initiatives

- Rules and Queries
  - RuleML
  - SparQL
  - RIF
  - SWRL
  - …
- Graph Queries
  - Graph Query Lang
  - Linked Data API
  - …
- Ontologies
  - ODM
  - RDF API
  - OWL API
  - OntoCat
  - OWLIM
  - …
- Terminologies
  - CTS2
  - IEPV
  - …
- Agents
  - FIPA
  - …

API4KB Initiative Roadmap

- Publish RfP (✔)
- Collect a Use Case Library (↻)
  - Define the scope for the standard
- Design the specification (↻)
- Provide Reference Implementations (✖)

API4KB Principles / 1

API4KB vision:

- Adaptive Services
  - Client's request may be specific
    - e.g. a SPARQL query
  - The service provider will try to approximate (best effort) the request
  - Even if the KB/reasoner does not support it natively
    - → Semantics
    - → Metamodels
    - → Translations
    - …

API4KB Principles / 2

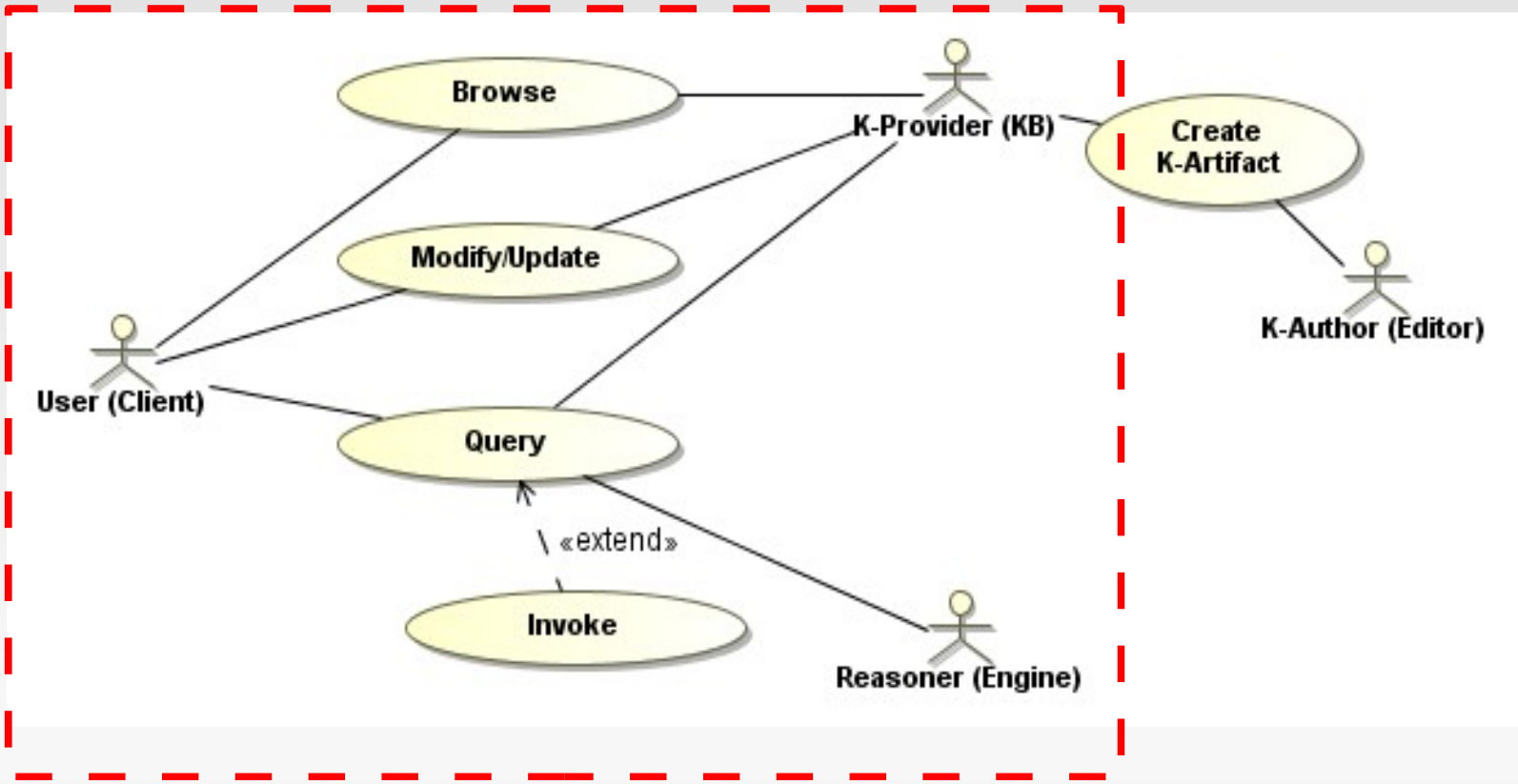
API4KB vision:

- Transparency w.r.t provider
  - Abstract Knowledge Content
  - Abstract Reasoner Capabilities
  - The Client should be unaware of the service provider's nature
    - (Unless they explicitly want to)

- Transparency w.r.t coupling
  - Strongly Coupled (library)
  - Loosely Coupled
  - Decoupled

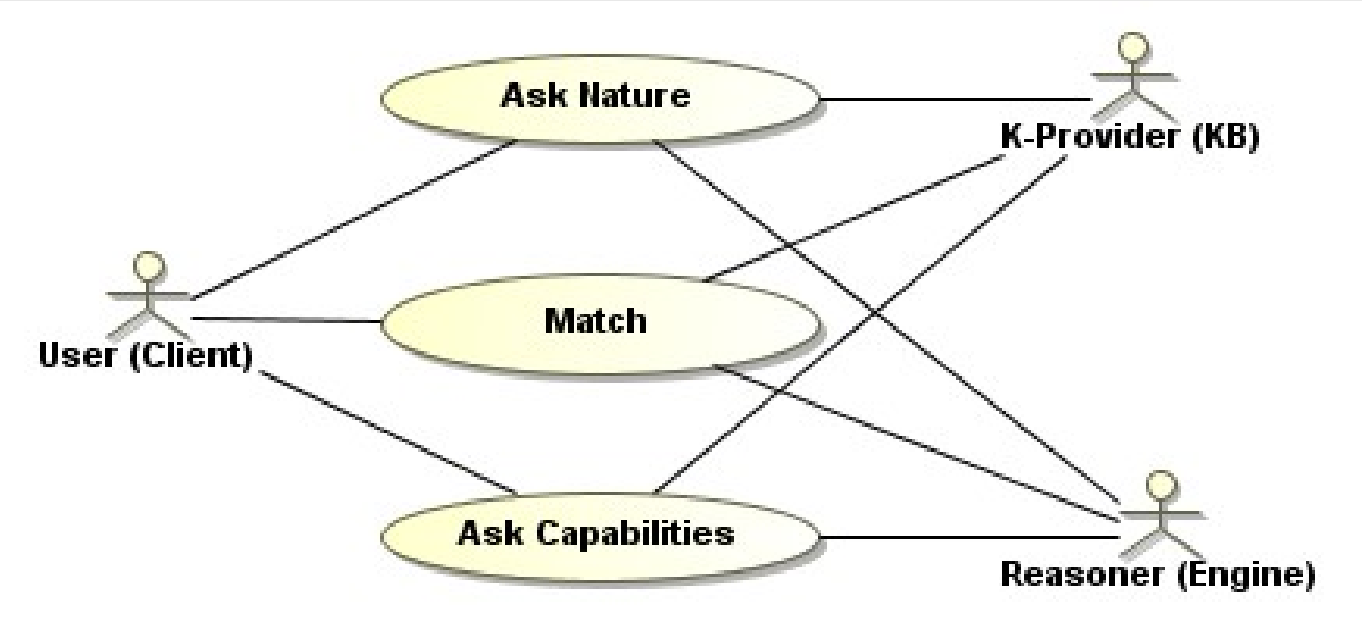
API4KB Actors / 1

- APIs expose common services



API4KB Actors / 2

- Universal Meta-API
  - expose metadata
  - expose configuration options



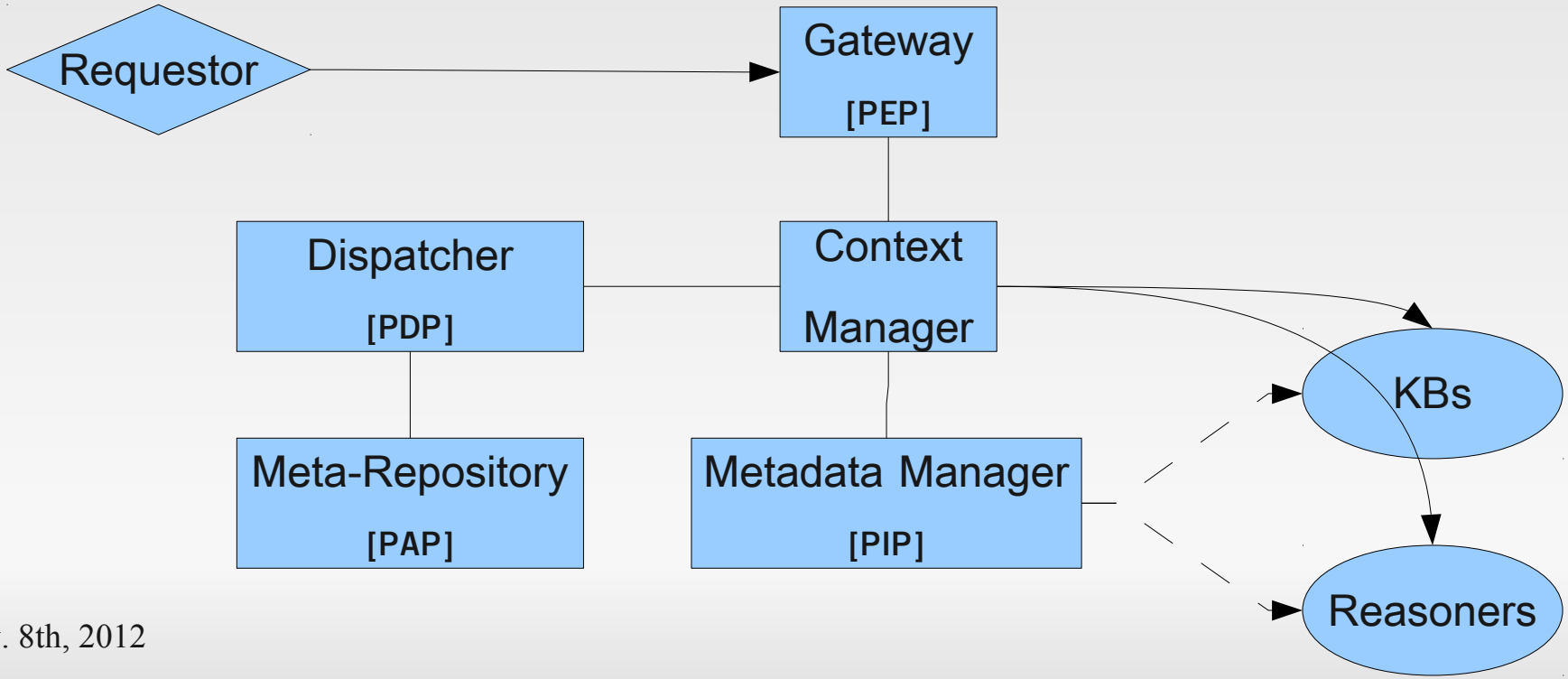
API4KB Requirements

- Parsing and Storing
  - Knowledge “Content” vs Knowledge ”Format”
  - Import
  - Export

- Reasoning
  - Check : Consistency and Validation
  - Infer : Ontology- vs Rule- based
  - Report : Metrics
  - Explain : Truth maintenance and Justification
  - Reconcile : Input Data *vs* Knowledge Base(s) *vs* Reasoner(s)

API4KB Meta-API architecture

- XACML-inspired
  - Internal access control
  - Dispatch



API4KB API architecture

- Current topic for discussion

- ”Knowledge-managing” agents
  - Protocols
    - Negotiation
    - Access

API4KB : Next Steps

- Create a significant, public, Use Case Library
  - → Contributions from the community and interested parties are welcome
- Design the core APIs
  - → Bring together experts from different fields: ontologies, rules, etc.. to harmonize the existing, base standards
- Select the appropriate binding(s) for implementation
  - → Evaluate interface meta-models

References and Contacts

- **API4KB** Wiki:
  - http://www.omgwiki.org/API4KB/doku.php

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Questions ?

Thank you for your attention!