API4KB Working Group
---
Meeting Update

D.Sottara, PhD
OMG Technical Meeting – Spring 2013, Reston, VA
Requirements - Summary

• Problem

Provide *uniform access* to Knowledge Bases

- Simple, static KBs
- Working Memories with Hybrid reasoners
- Multiple KBs with loosely coupled, heterogeneous reasoners
- ....
• Composite KBs:
  
  • Ontologies (T-box + A-box)
  
  • Rulebases (Rules + Facts)
  
  • Predictive Models (Models + Datasets)
  
  • Business Processes (Processes + Instances)
  
  • ...
Requirements - Summary

- Multiple Bindings
  - (Java | C++ | …) Library, REST, SOAP, …

- Distributed, open environment
  - Prefer stateless, idempotent, concurrent calls

- Post-coordination
  - Simple APIs, highly configurable
API Categories

- Parsing & Translation
- KB Construction
- Query
- Reasoning
- Meta
API4KB
API4KB

Reasoner

Fact Working Set

Model Base

Fact Base

Orchestration Model

Knowledge Base
Metamodel

- “Knowledge and Reasoning Systems Ontology”
  - Model of Knowledge and Reasoning for knowledge-based systems
- Configuration
- Operation Specification
- Explanation
Metamodel Basics

- **KnowledgeBaseAssetDescriptor**
  - Placeholder for KB component model
    - **ID**
      e.g. URI
    - **Location**
      e.g. URL
    - **Content**
      e.g. OWL, Ruleset
    - **Syntax / Serialization**
      e.g. Manchester Syntax, RuleML
Metamodel Basics

- **KnowledgeOutcomeDescriptor**
  - Placeholder for Reasoning Process outcome descriptor
  - **result**
    - e.g. code
  - **Explanation**
    - **Descriptor**
    - **Proof (PML?)**
Parsing API

- **Parse**
  - in URL asset,
  - in KBADescr descriptor,
  - out Expl result
  - Verifies whether asset is compatible with descriptor

- **Translate**
  - in URL asset,
  - in KBADescr source,
  - in KBADescr target,
  - in URL loc,
  - out Expl result
  - Parses the asset described by source and creates a new representation, compatible with target, deploying it at loc
KB Construction API

- **CreateKB**
  
in URI kbID,
in URL kbLoc,
out URL effectiveLoc

  - Tries to ensure that a KB with ID kbID exists at kbLoc, creating it if necessary

- **SetAsset**
  
in URI kbID,
in URI assetID,
in URL assetLocation,
in KBADescr descr,
out Expl result

  - Tries to ensure that an asset is part of a Knowledge Base
KB Construction API

- **ReadAsset**
  
in URI kbID,
in URI assetID,
out KBADescr descr
out KBAsset asset

  - *Returns the asset with* assetID *contained in a KB*

- **ExportAsset**
  
in URI kbID,
in URI assetID,
in KBADescr descr,
in URL targetLocation,
out Expl result

  - *Exports* assetID *from a KB to* targetLocation,* in a format compatible with* descr
KB Construction API

- **DeleteAsset**
  
in URI kbID,
in URI assetID,
out Expl result

  - Removes the asset with assetID contained in a KB

- **UpdateAsset**
  
in URI kbID,
in URI assetID,
in KBADescr descr,
in URL sourceLocation,
out Expl result

  - Updates assetID with a new version at sourceLocation
Reasoning API

- **CheckConsistency**
  - in URI kbID,
  - out Expl result
  - Checks the consistency and the integrity of a knowledge base, returning an explanation with the results

- **Classify**
  - in URI kbID,
  - in boolean materialize,
  - out Expl result
  - Computes all possible type inferences for individuals in the knowledge base

- **Infer**
  - in URI kbID,
  - in boolean materialize
  - out Expl result
  - Computes all possible entailments
Query API

- Inform
  in URI kbID,
  in ANY content,
  in KBADescr descr,
  in boolean preserveConsistency,
  out Expl result

  “Tells” something to the KB, adding the content in format descr, possibly trying to preserve consistency
Query API

- **QueryIf**
  
in URI kbID,
in ANY content,
in KBADescr descr,
out Expl result

  - Checks whether content is part of the KB or not

- **Query**
  
in URI kbID,
in ANY query,
in KBADescr descr,
in KBADescr outDescr,
out ANY answer,
out Expl result

  - Queries the KB, submitting a query in format descr, returning answer in the format defined by outDescr
Query API

- Request
  - in URI kbID,
  - in ANY query,
  - in KBADescr descr,
  - in KBADescr outDescr,
  - in boolean preserveConsistency,
  - in boolean materialize,
  - out ANY answer,
  - out Expl result

  - **Combination of** Inform + Infer + Query.
  The result will be added to the KB only if explicitly stated
Meta API

- **reportMetrics**
  - Returns a descriptive statistics of the content of the knowledge base

- **reportKBCapabilities**
  - Describes the capabilities of the KB, in terms of the metamodel

- **reportReasonerCapabilities**
  - Describes the capabilities of available reasoners, in terms of the metamodel