A Reasoning Broker Framework for Protégé

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Reasoning on ontologies
- DL based ontologies provide well defined semantics
- Allows for automatic inference of implicit knowledge

Reasoning systems
- Pellet, FaCT++, RacerPro, KAON2, HermiT, CEL, …, Screech, AQA
- Different strengths and weaknesses
- Different language expressivity
- Different APIs

Reasoning in protégé
- Consistency checking
- Querying (DL Query tab)
Reasoning Brokerage

Extension Points

ReasonerFactory

Tabs and Views

OWL API

HERAKLES
[localhost]

Configuration

Monitoring

External Remote Reasoners

AQA [server1.com]

Pellet [server2.com]

FaCT++ [server3.com]

KAON2 [server4.com]

Screech [server5.com]

...
Broker Strategies

- Strategies control behaviour of reasoning broker

- Different broker features
  - Parallel execution of reasoning tasks
  - Reasoner selection
  - Partitioning of ontologies
  - Load balancing

- Development of customised strategies by using *strategy components*
  - Paralleliser
  - Selector
  - (Analyser)
  - (Modulariser)
Broker Strategies cont.

- **Load strategies**
  - Basic load strategy
  - Analysing load strategy

- **Execution strategies**
  - Parallelising strategy
  - Selection strategies
    - Selection according to reasoning task
    - Selection according to ontology properties
  - Anytime strategies
  - (Partitioning strategies)
Broker Strategies Example

Reasoning Task: **Consistency Checking**
Reasoning Task: **Consistency Checking**
Broker Strategies Example

Reasoning Task: **Instance Retrieval**
Broker Strategies Example

Reasoning Task: Instance Retrieval
Protégé Integration

- Selection of external remote reasoners
- Strategy selection and configuration
- Monitoring of external remote reasoners
- Anytime querying
Anytime Reasoning

- Continuous delivery of (preliminary) results
- Anytime reasoner interface complementary to traditional OWLReasoner interface
- Anytime Query Tab in protégé
- Anytime behaviour by use of approximate reasoning systems (Screech, AQA)
  - Trading soundness / completeness for speed
Summary

- Protégé plug-in for HERAKLES reasoning broker
- Controlled delegation of reasoning requests to various external remote reasoners
- Behaviour controlled by broker strategies
  - Parallelisation
  - Selection
  - Partitioning (planned)
  - Anytime reasoning (currently by approximation)
- Additionally
  - Real-time benchmarking
  - Centralised caching
Thanks for your attention!