ORE2014

OWL Reasoner Evaluation

Competition brought to you by

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Participating OWL DL Reasoners

- **FaCT++** (tableau reasoner) by Dmitry Tsarkov

- **JFact (**a Java port of the FaCT++) by Dmitry Tsarkov, Ignazio Palmisano

- **HermiT** (hypertableau) by Boris Motik, Rob Shearer, Birte Glimm, Giorgos Stoilos, Ian Horrocks

- **Konclude** (tableau, parallel) by Andreas Steigmiller, Thorsten Liebig, Birte Glimm

- **TReasoner** (tableau) by Andrey Grigoryev

Portfolio Reasoners

- **Chainsaw** (uses Atomic Decompositions) by Dmitry Tsarkov, Ignazio Palmisano

- **MORe** (uses module extraction techniques) by Ana Armas Romero, Ernesto Jimenez Ruiz, Bernardo Cuenca Grau, Ian Horrocks, Cristina Feier

Approximation-Based Reasoners

- **TrOWL** by Jeff Z. Pan, Yuan Ren, Edward Thomas, Nophadol Jekjantuk, Stuart Taylor, Jhonatan Garcia

Participating OWL EL Reasoners

- **ELepHant** by Baris Sertkaya
- **ELK** (parallel) by Yevgeny Kazakov, Markus Krötzsch, František Simančík, Pavel Klinov
- **jcel** by Julian Mendez

The Disciplines

Classification

- Classify an OWL 2 DL/EL ontology
- DL: Chainsaw, FaCT++, HermiT, JFact, Konclude, MORe, TReasoner, TrOWL
- EL: Chainsaw, ELepHant, ELK, FaCT++, HermiT, jcel, JFact, Konclude, MORe, TReasoner, TrOWL

Consistency

- Check whether an OWL 2 DL/EL ontology is consistent and has a model
- DL: Chainsaw, FaCT++, HermiT, JFact, Konclude, MORe, TReasoner
- EL: Chainsaw, ELepHant, ELK, FaCT++, HermiT, jcel, JFact, Konclude, MORe, TReasoner

Realisation (★ new in 2014 ★)

- Identify the types of all individuals in an OWL 2 DL/EL ontology
- DL: Chainsaw, FaCT++, HermiT, JFact, Konclude, TrOWL
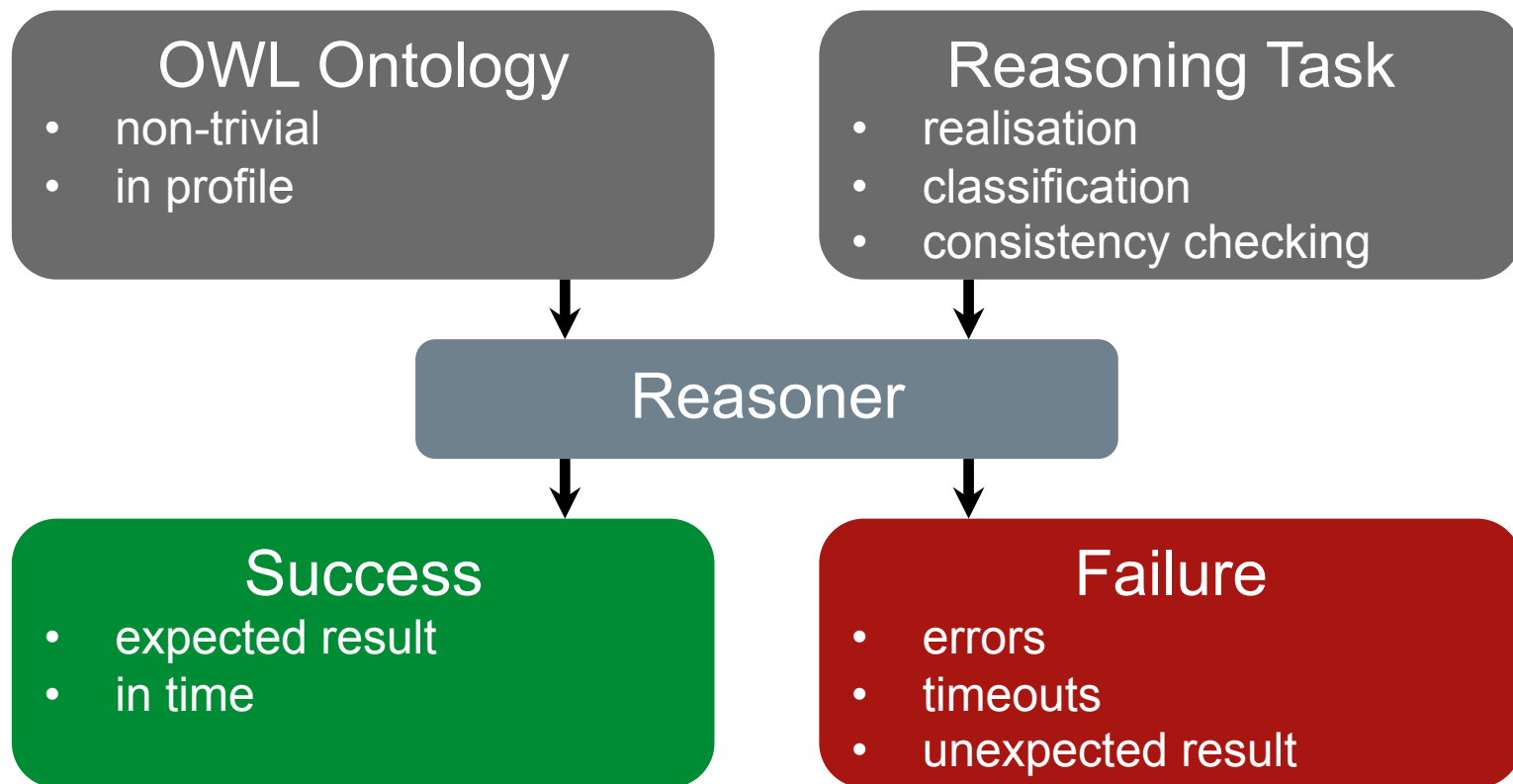- EL: Chainsaw, ELepHant, ELK, FaCT++, HermiT, JFact, Konclude, TrOWL

The Corpus

- 16 555 unique ontologies

- Sources:

  – MOWLCorp (Manchester OWL Corpus)
    http://mowlrepo.cs.manchester.ac.uk

    - Web Crawl,

    - Google Custom Search API

    - User Submissions

  – Oxford Ontology Library

  – BioPortal Snapshot June 2014

  – User submitted ontologies

    - BioKB (2013), DMOP, FHKB, USDA, DPC, genomic-CDS, City-Bench,...

- Get: http://zenodo.org/record/10791

The Tested Ontologies

DL	Pure DL	EL	QL	RL	RDFS

Pure DL
- very small
- small
- medium
- large
- very large

7 704
(2 439)

EL
- very small
- small
- medium
- large
- very large

8 805
(1 941)

QL

2 327
(483)

→ number of ontologies in the profile

→ number of ontologies with ABox

DL

16 555
(4 395)

- Create a file list iterating through the bins
- Skip emptied bins
- Use the first X files for the competition

	X (OWL DL)	X (OWL EL)
Classification	250	300
Consistency	200	250
Realisation	200	250

What Is Measured

OWL Ontology
- non-trivial
- in profile

Reasoning Task
- realisation
- classification
- consistency checking

Reasoner

Success
- expected result
- in time

Failure
- errors
- timeouts
- unexpected result

- A result is expected if the majority of the reasoners agree on it
- In case of a draw, one result is randomly chosen and declared expected
- In time: <= 2.5 min for reasoning, <= 3 min for reasoning + parsing

The Hardware

- Cluster at the University of Manchester provided by Konstantin Korovin

- QuadCore Intel Xeon CPU@2.33GHz

- Running a rather old Fedora 12

- Java version 1.6.0_18

- One reasoner per machine

- 12GB RAM, 10GB RAM for the reasoner

http://bit.ly/1oEweet
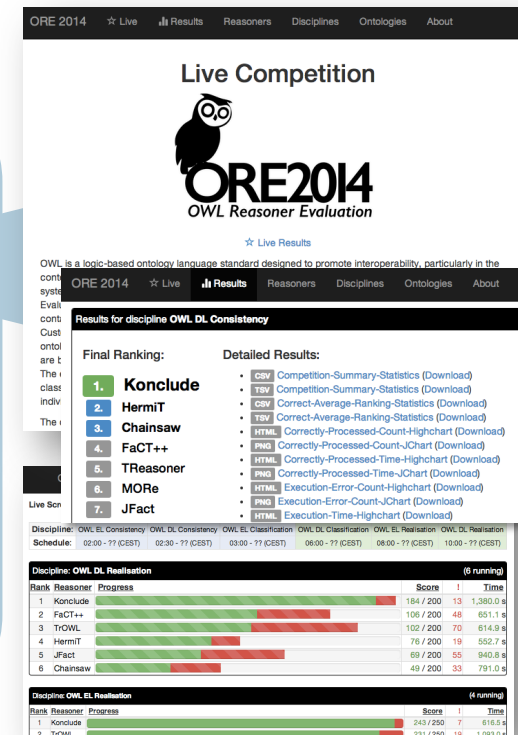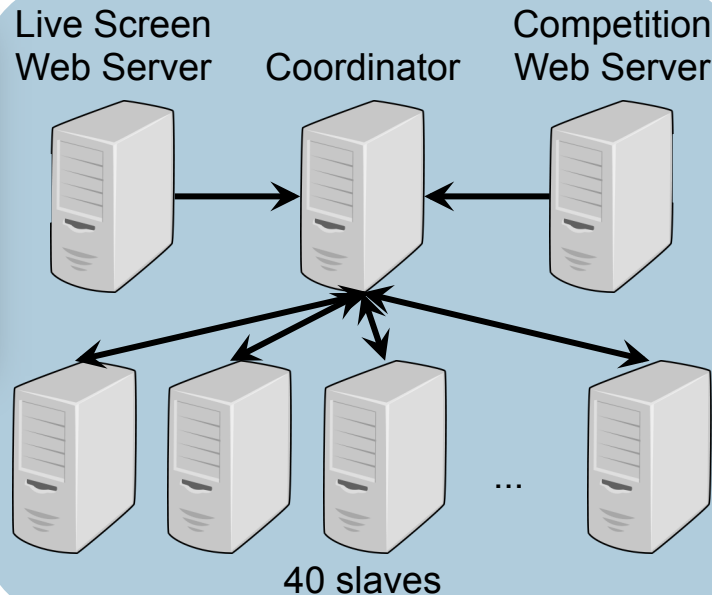
Competition Results

OWL DL Consistency

1. Konclude
2. Chainsaw
3. HermiT

Rank	Reasoner	Progress	Score	!	Time
1	Konclude		194 / 200	6	541.0 s
2	Chainsaw		186 / 200	14	521.7 s
3	HermiT		184 / 200	16	1,055.3 s
4	FaCT++		176 / 200	24	1,679.0 s
5	TReasoner		145 / 200	55	1,398.1 s
6	MORe		143 / 200	56	1,286.6 s
7	JFact		88 / 200	82	1,248.8 s

Discipline: OWL DL Consistency (finished)

OWL DL Classification

1. Konclude
2. HermiT
3. MORe

Rank	Reasoner	Progress	Score	!	Time
1	Konclude		224 / 250	26	1,098.2 s
2	HermiT		181 / 250	69	3,863.3 s
3	MORe		178 / 250	72	1,659.8 s
4	TrOWL		172 / 250	78	2,318.2 s
5	FaCT++		147 / 250	103	943.7 s
6	JFact		102 / 250	148	640.3 s
7	Chainsaw		91 / 250	144	1,020.7 s
8	TReasoner		8 / 250	242	34.1 s

Discipline: OWL DL Classification (finished)

OWL DL Realisation

1. Konclude
2. FaCT++
3. TrOWL

Rank	Reasoner	Progress	Score	!	Time
1	Konclude		178 / 200	22	866.3 s
2	FaCT++		112 / 200	88	458.5 s
3	TrOWL		106 / 200	94	1,126.7 s
4	HermiT		98 / 200	102	1,421.2 s
5	JFact		63 / 200	137	576.3 s
6	Chainsaw		49 / 200	151	707.4 s

Discipline: OWL DL Realisation (finished)

Competition Results

OWL EL Consistency

1. ELK
2. Konclude
3. MORe

Discipline: OWL EL Consistency					(finished)
Rank	**Reasoner**	**Progress**	**Score**	**!**	**Time**
1	ELK		250 / 250	0	566.5 s
2	Konclude		249 / 250	1	412.5 s
3	MORe		244 / 250	6	1,470.7 s
4	Chainsaw		237 / 250	13	441.4 s
5	HermiT		236 / 250	14	607.1 s
6	FaCT++		234 / 250	16	502.2 s
7	jcel		228 / 250	22	2,170.9 s
8	TReasoner		223 / 250	27	2,371.7 s
9	ELepHant		212 / 250	38	142.7 s
10	JFact		168 / 250	50	1,844.6 s

OWL EL Classification

1. Konclude
2. MORe
3. ELK

Discipline: OWL EL Classification					(finished)
Rank	**Reasoner**	**Progress**	**Score**	**!**	**Time**
1	Konclude		297 / 300	3	659.7 s
2	MORe		292 / 300	8	2,112.8 s
3	ELK		284 / 300	16	1,146.6 s
4	TrOWL		283 / 300	17	2,477.9 s
5	HermiT		271 / 300	29	3,743.2 s
6	FaCT++		241 / 300	59	1,962.7 s
7	JFact		192 / 300	108	3,564.2 s
8	Chainsaw		147 / 300	131	1,559.0 s
9	jcel		114 / 300	134	85.6 s
10	ELepHant		62 / 300	238	164.8 s
11	TReasoner		22 / 300	254	89.4 s

OWL EL Realisation

1. Konclude
2. TrOWL
3. FaCT++

Discipline: OWL EL Realisation					(finished)
Rank	**Reasoner**	**Progress**	**Score**	**!**	**Time**
1	Konclude		243 / 250	7	474.5 s
2	TrOWL		226 / 250	24	1,339.2 s
3	FaCT++		221 / 250	29	522.4 s
4	JFact		178 / 250	72	4,836.9 s
5	ELK		157 / 250	93	645.5 s
6	HermiT		121 / 250	129	1,044.9 s
7	Chainsaw		107 / 250	134	1,018.3 s
8	ELepHant		105 / 250	145	21.2 s

Betting Winners

- Draw a ticket
- Guess how many ontologies the drawn reasoner can classify
- Shortened coffee break ➔ less time for betting ☹
- Still 26 bets were made

Discipline	Winner	Reasoner	Max	Bet	Real	Off
DL Classification	Pavel Klinov	HermiT	250	180	181	**1**
EL Classification	Elena Botoeva	ELK	300	284	284	**0**

Olympic Medal Winner

- Only three winners per competition allowed ☹

- Reasoners ranked according to

    Expected Results / Tasks Attempted

1. Konclude with 95.5%

2. ELK with 86.4%

3. MORe with 85.7%

Award Ceremony
Monday, July 21st
16:30-19:00
Kuppelsaal

Kuppelsaal

DL

Challenges for Next Year

- Getting OWL QL reasoners to participate
- Finding Organisers (Volunteers?)
  - Collecting Ontologies (OWL QL)
  - Collecting Queries for a Query Answering discipline
  - Working with the reasoner developers
  - Organising sponsorship
  - T-shirts & betting
  - Improving the competition framework
    - Web-based reasoner submission system with automatic tests for compliance with the framework
    - Better automatic results evaluation

The Competition Organisers

ORE Competition Organisers

- Birte Glimm (University of Ulm)

- Nicolas Matentzoglu (University of Manchester)

- Bijan Parsia (University of Manchester)

- Andreas Steigmiller (University of Ulm)

Competition Infrastructure

- Konstantin Korovin (University of Manchester, Royal Society grant RG080491)

Local Organisers

- Magdalena Ortiz (Vienna University of Technology)

- Mantas Šimkus (Vienna University of Technology)

Olympic Games Chair

- Thomas Krennwallner (Vienna University of Technology)

Sponsors