



Semantic Evaluation at Large Scale Tutorial

Evaluating Ontology Matching Tools

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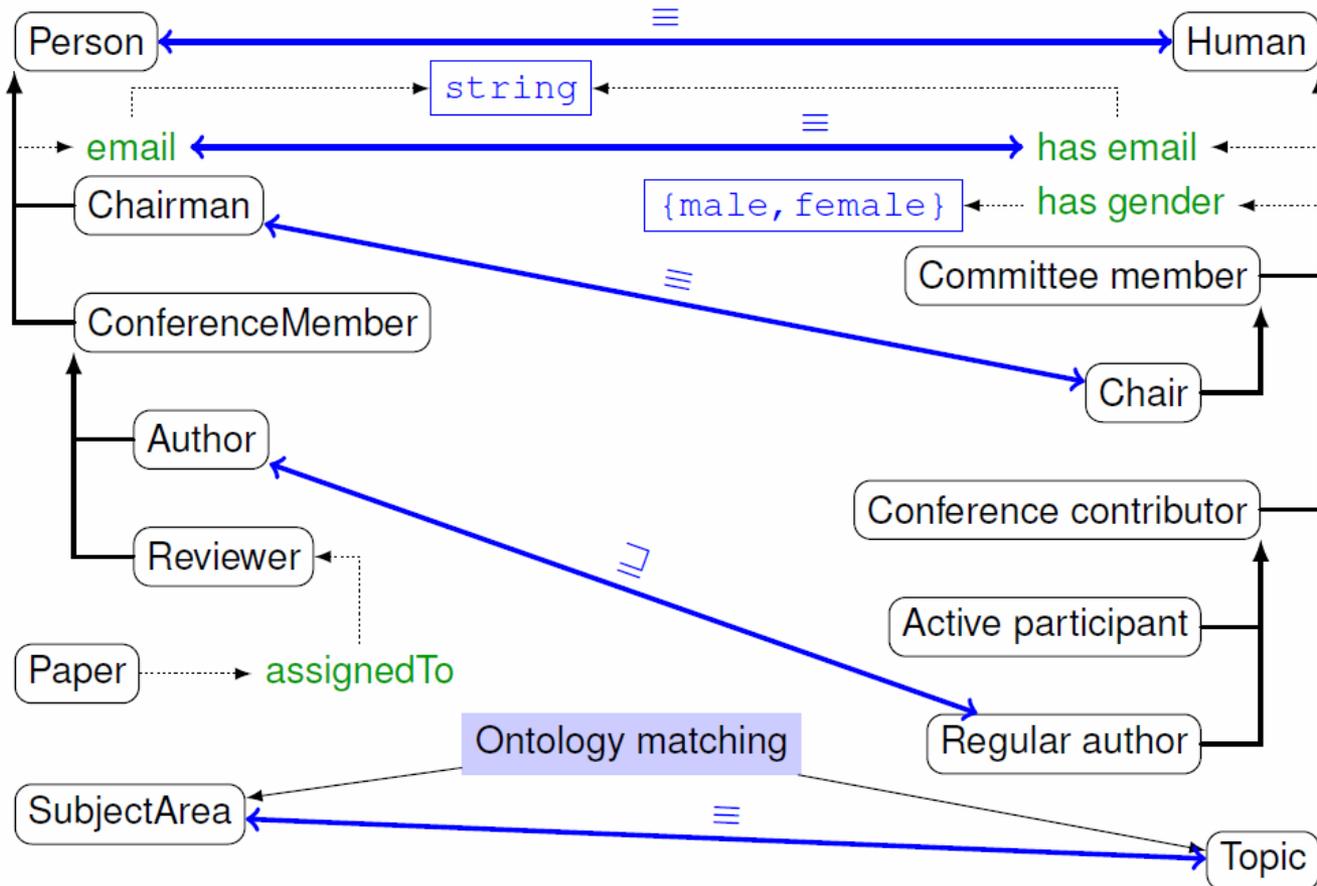
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Outline

- **Background on Ontology Matching**
- Metrics for Evaluating Matching Systems
- OAEI Datasets and Scenarios
- Webbased & Platformbased Evaluation
- Usage of Testclient / Tool Wrapping
- Plans for OAEI 2011 & References

Ontology Matching



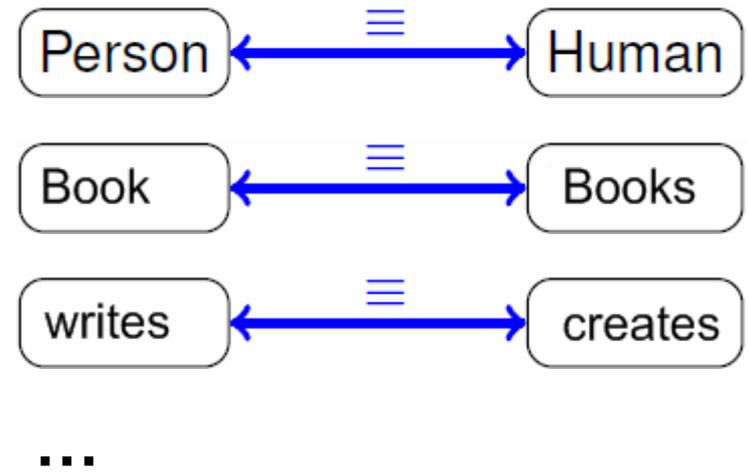
Terminology

- **Correspondence**
- Alignment
- Reference Alignment
- Matching System (Matcher)
- OAEI (Ontology Alignment Evaluation Initiative)



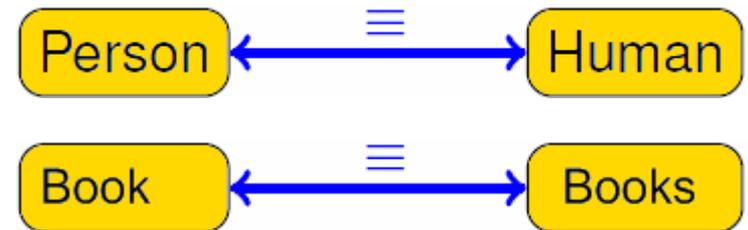
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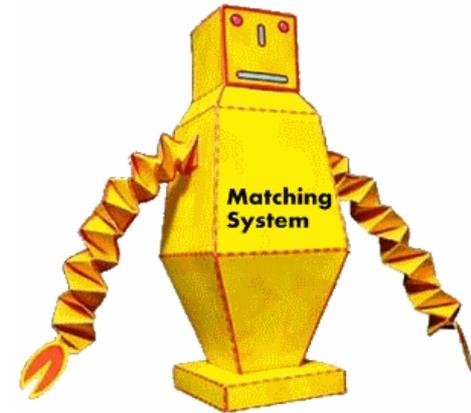
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OAEI

- Annual evaluation campaign at ISWC ontology matching workshop
 - Comparing performance of matching systems
 - Support to improve ontology matching
- Divided in several tracks, track = dataset + evaluation methods
- Each track conducted by a different group of researchers
 - *Until 2009: Alignments generated by tool developers and submitted to organizers for evaluation*
 - *Evaluation of submitted alignments and generation of results often scriptbased + spreadsheets + ...*
 - *2010 & 2011 with SEALS support*

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Compliance-based Metrics

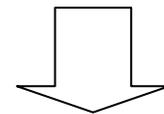
- Based on comparing generated alignment A against reference alignment R
- Precision, recall, and f-measure (harmonic mean of precision and recall)

$$P(A, R) = \frac{|A \cap R|}{|A|} \quad R(A, R) = \frac{|A \cap R|}{|R|}$$



Person = Person A
writtenBy = hasWritten
FirstAuthor < Author

Person = Person R
FirstAuthor < Author
Paper = Article
Document = Contribution



$$P(A, R) = 2/3 = 0.66$$
$$R(A, R) = 2/4 = 0.5$$

Other Metrics

- Variants of Precision & Recall
 - Semantic Precision and Recall
 - Manual labeling / sampling
- Efficiency and Scalability
 - Runtime and memory consumption
- Conformance to standards
 - Alignment API, format of input ontologies, ...
- Coherence of alignments
 - Unsatisfiability as a result of using the alignment

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Important Datasets from OAEI

- Benchmark
 - More than 50 testcases; one ontology (33 named classes, 24 object properties, 40 data properties) has to be matched on systematic, artificially generated variations
- Anatomy
 - Two ontologies from biomedical domain (approx. 3000 classes, more than 1000 correspondences in R)
- Conference
 - Several ontologies from conference domain (30-200 classes), reference alignment between all pairs from a subset of 7 ontologies

Benchmark (#249-2)

The image displays a screenshot of an ontology editor interface. On the left, a tree view shows a hierarchy of classes. The 'Reference' class is highlighted, and a URL is shown: <http://oaei.ontologymatching.org/2010/benchmarks/101/onto.rdf#Reference>. The right pane shows the details for the 'Reference' class, including its description and a list of superclasses containing 'date max 1 Thing'. Below this, another tree view shows the 'sqdsq' class hierarchy, with 'sqdsq' selected. The right pane shows the details for 'sqdsq', including its description and a list of superclasses containing 'date max 1 Thing', 'dznbaln max 1 Literal', and 'humanCreator max 1 Thing'.

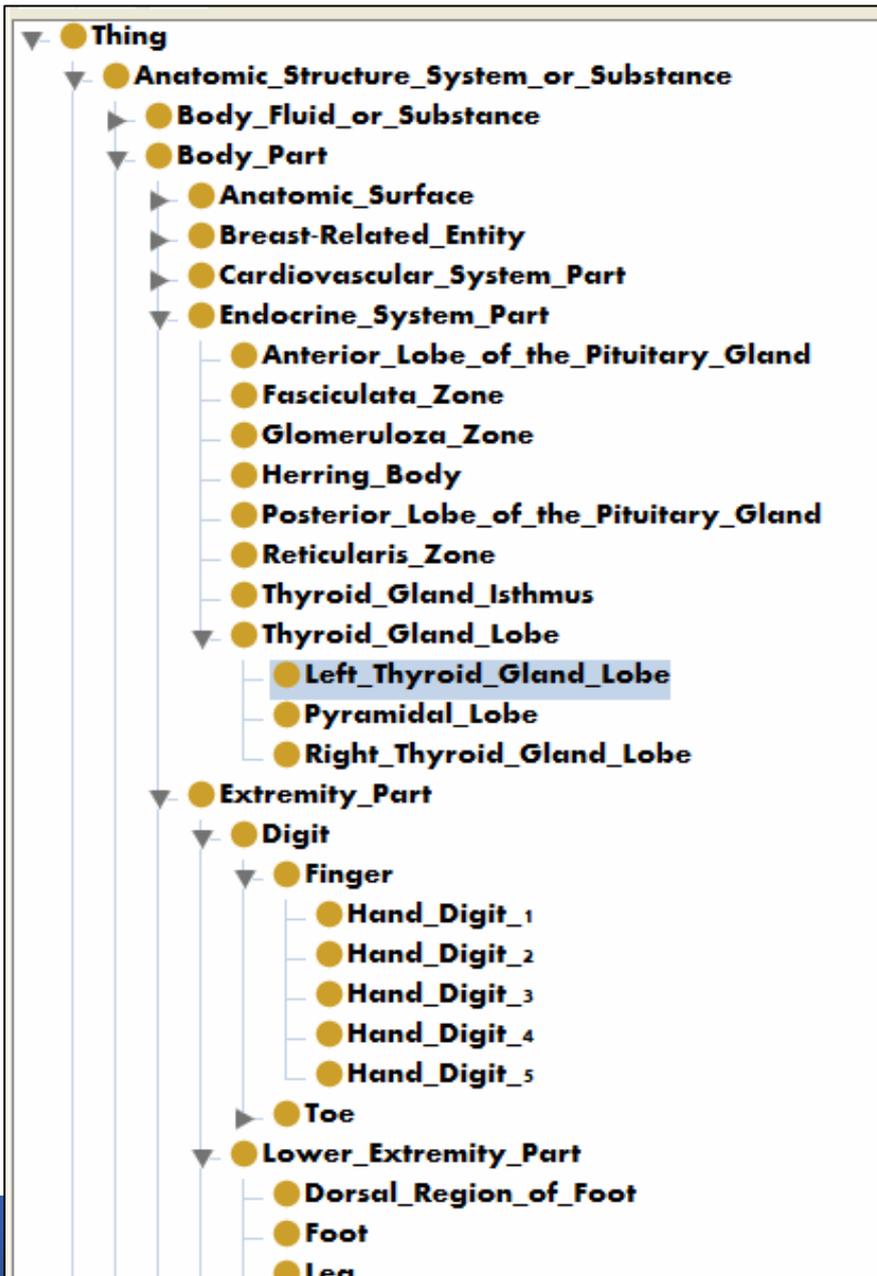
Reference Class Details:

- Description: Reference
- Equivalent classes: +
- Superclasses: +
 - date max 1 Thing

sqdsq Class Details:

- Description: sqdsq
- Equivalent classes: +
- Superclasses: +
 - date max 1 Thing
 - dznbaln max 1 Literal
 - humanCreator max 1 Thing
- Inherited anonymous classes
- Members: +
- Keys: +

Anatomy (human)



Conference (CMT)

The screenshot displays a software interface with two main panels. The left panel, titled 'Class hierarchy: Review', shows a tree structure of classes. The right panel, titled 'Usage: Review', shows a list of uses for the 'Review' class.

Class hierarchy: Review

- Thing
 - Bid
 - Conference
 - Decision
 - Acceptance
 - Rejection
 - Document
 - Paper
 - Review
 - Meta-Review
 - Person
 - Chairman
 - ConferenceMember
 - ExternalReviewer
 - ProgramCommitteeMember
 - User
 - Preference
 - ProgramCommittee
 - SubjectArea

Usage: Review

Show: this disjoints named sub/superclasses

Found 8 uses of Review

- Meta-Review
 - Meta-Review SubClassOf Review
- Paper
 - Paper DisjointWith Review
- Review
 - Paper DisjointWith Review
 - Class: Review
 - Review SubClassOf Document
- endReview
 - endReview Range Review
- writeReview
 - writeReview Range Review
- writtenBy
 - writtenBy Domain Review

Metrics applied in the past

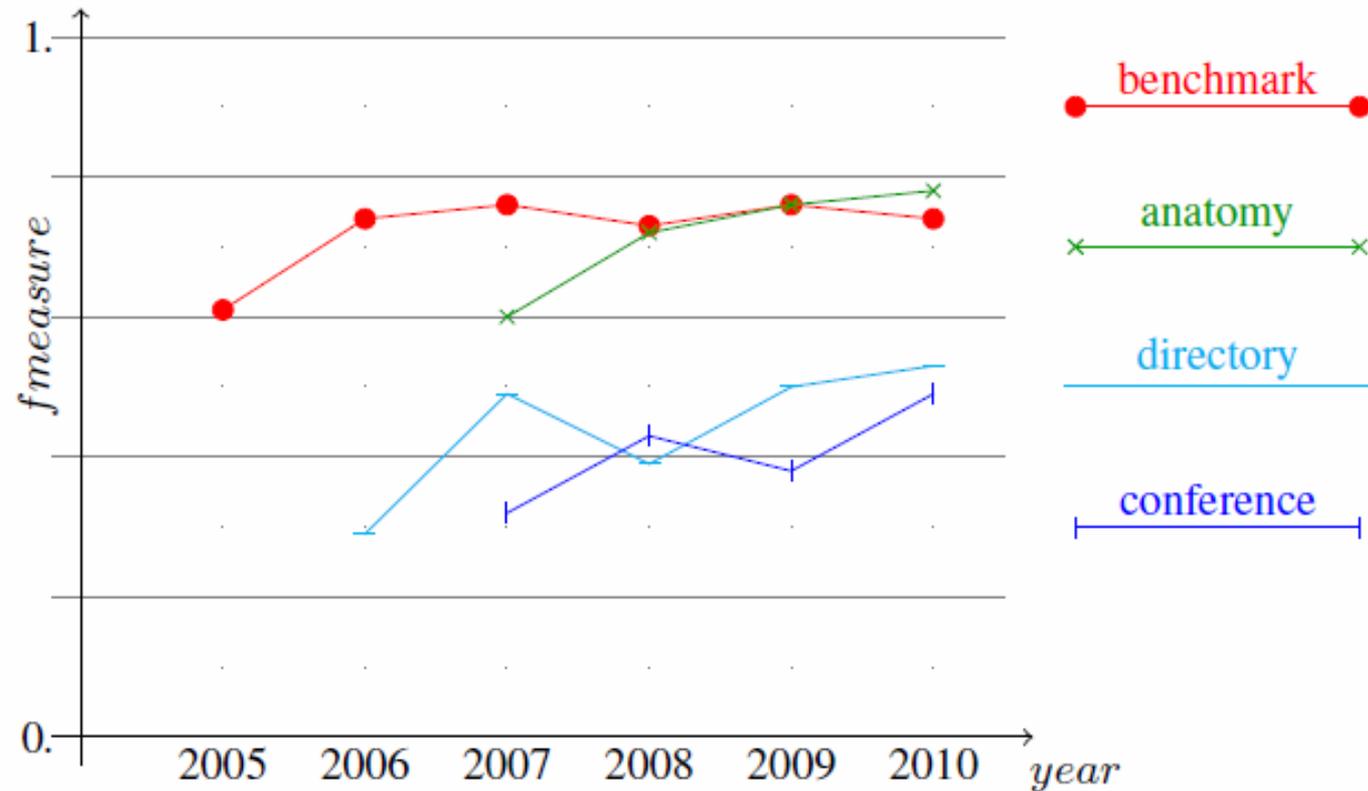
- Precision, recall, f-measure
- Conformance
- Coherency
- Runtime measurements (Efficiency/Scalability)
- Deployability

- Important aspect on meta-level:
 - Reproducibility of results!

Results OAEI 2010

- 15 participants / 13 participants for tracks in SEALS modality
- Benchmark (11)
 - ASMOV and RiMOM ahead, with AgrMaker as close follower
 - SOBOM, GeRMeSMB and Ef2Match achieve intermediary results
- Anatomy (9)
 - AgrMaker (prec. 90%, recall 85%) ahead, followed by Ef2Match, NBJLM and SOBOM
- Conference (8)
 - CODI ahead (prec. 88%, recall 52%) , with Falcon, Ef2Match and ASMOV as follower
 - most alignments are highly incoherent

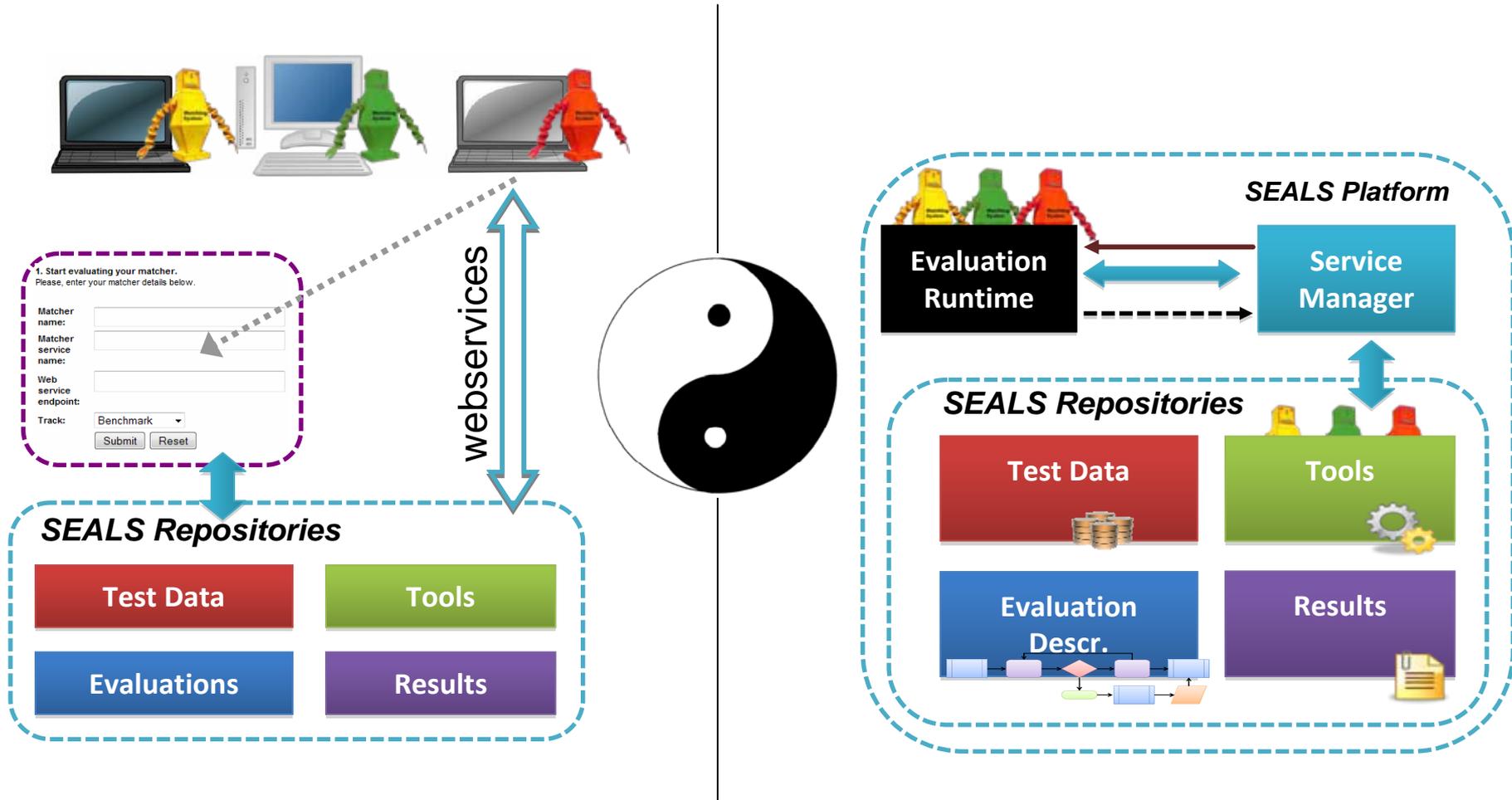
Results over last years



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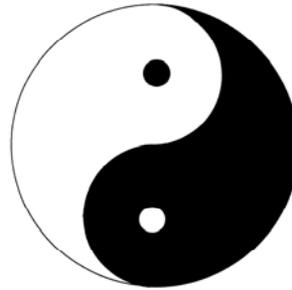
Two Approaches



Pros and Cons

Webbased approach

- Used in OAEI 2010
- Low barrier of usage
- Configuration/modifications can be tested on the fly
- No reproducibility of results
- No efficiency measurement possible



Platformbased approach

- Will be used in OAEI 2011
- Requires to upload tool
- Harder to test different configurations/modifications
- Results are attached to a certain version, can be reproduced any time
- Runtime measurements possible

Solving the problem

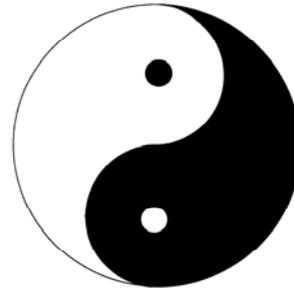
Testclient

- To be used in preliminary testing for OAEI 2011
- Low barrier of usage
- Configuration/modifications can be tested on the fly
- No reproducibility of results
- No efficiency measurement possible



Platformbased approach

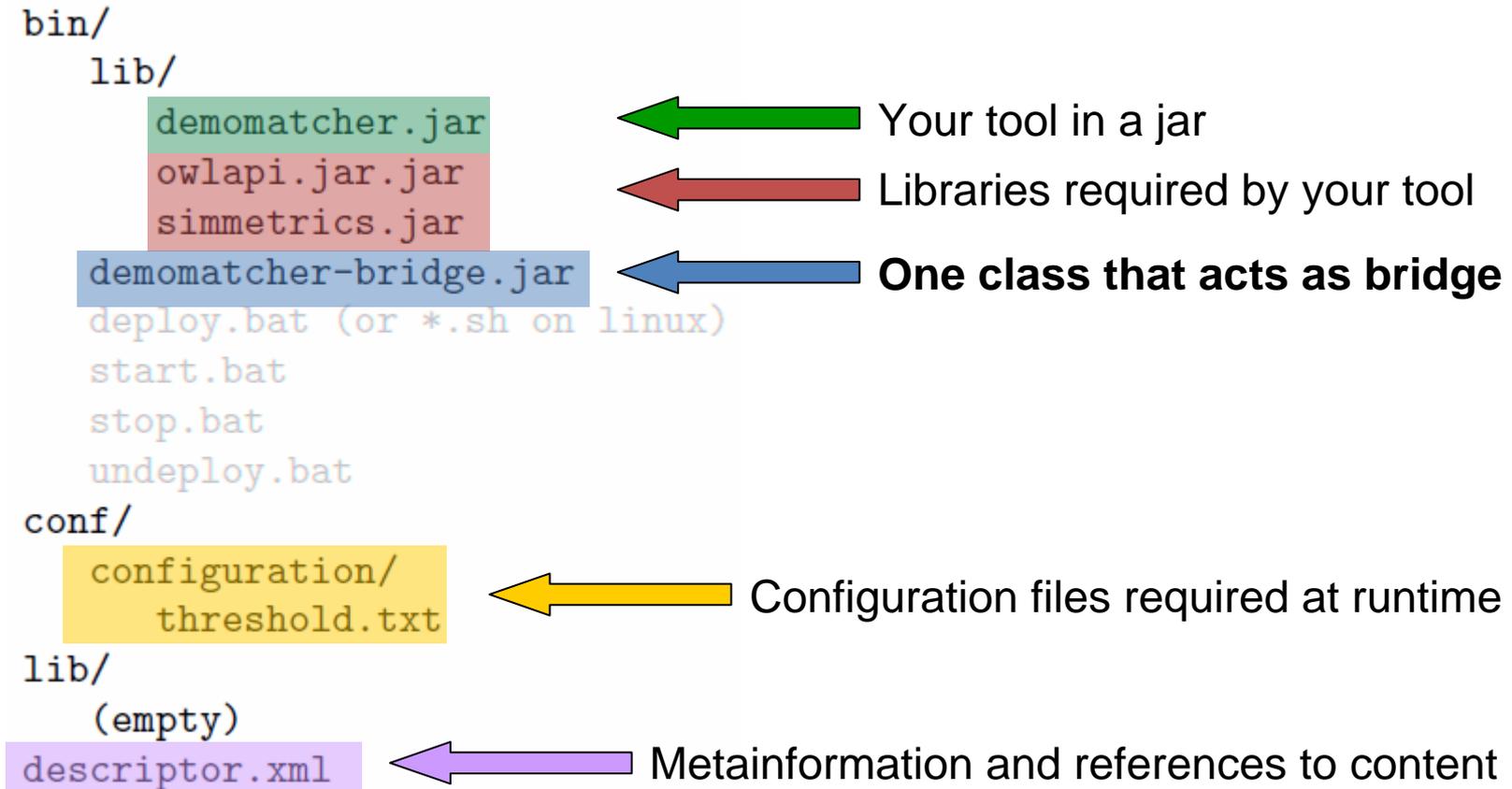
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Wrap your Tool (1)



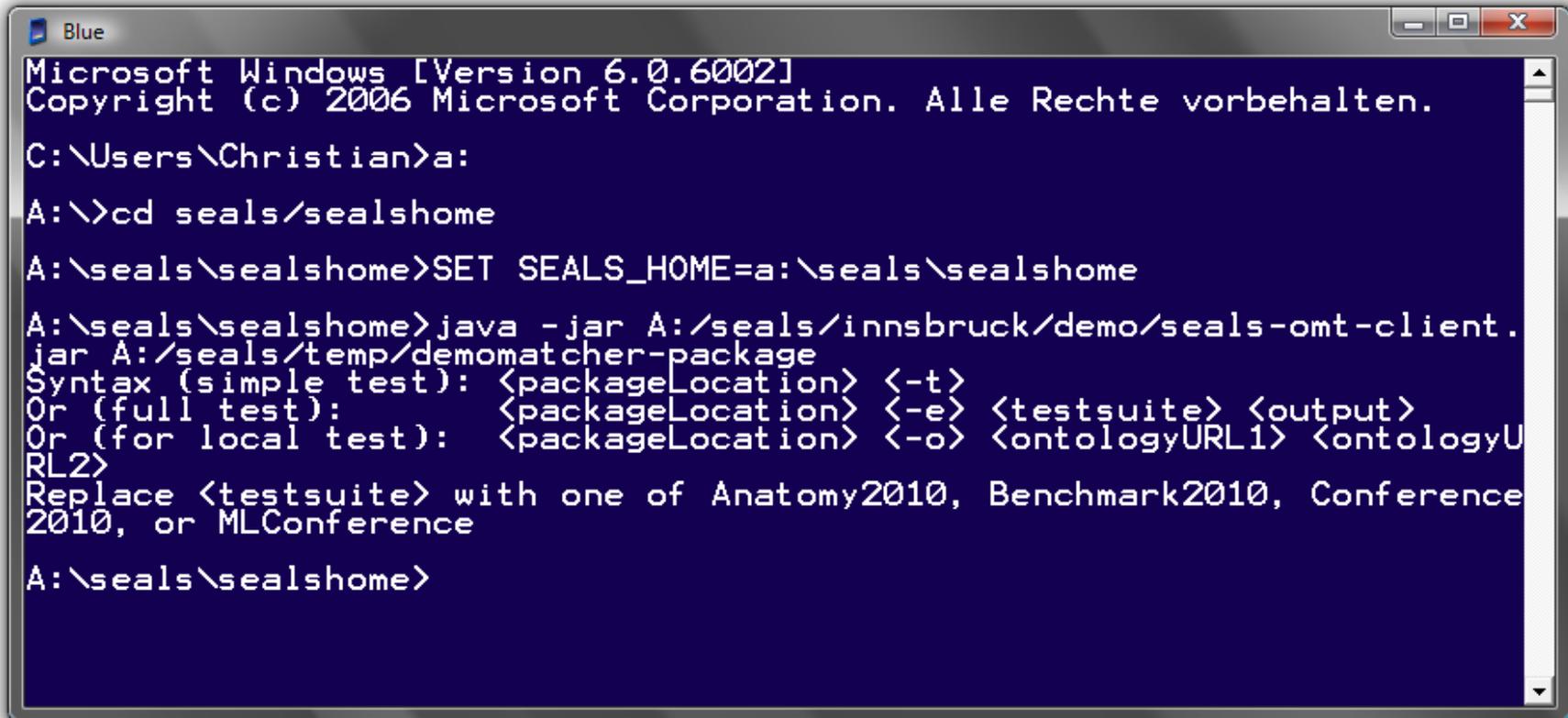
Wrap your Tool (2)

```
/**
 * Aligns two ontologies specified via their URL and returns the
 * URL of the resulting alignment, which should be stored locally.
 */
public URL align(URL source, URL target) throws ToolBridgeException, ToolException {
    DemoMatcher demoMatcher;
    try {
        demoMatcher = new DemoMatcher();
        try {
            String alignmentString = demoMatcher.align(source.toURI(), target.toURI());
            try {
                File alignmentFile = File.createTempFile("alignment", ".rdf");
                FileWriter fw = new FileWriter(alignmentFile);
```

Using the Alignment API?

- No need to write the Bridge, we offer mechanism to build a package that includes the Bridge (available soon).

Execute your Tool



```
Blue
Microsoft Windows [Version 6.0.6002]
Copyright (c) 2006 Microsoft Corporation. Alle Rechte vorbehalten.

C:\Users\Christian>a:
A:\>cd seals/sealshome
A:\seals\sealshome>SET SEALS_HOME=a:\seals\sealshome
A:\seals\sealshome>java -jar A:/seals/innsbruck/demo/seals-omt-client.jar A:/seals/temp/demomatcher-package
Syntax (simple test): <packageLocation> <-t>
Or (full test):      <packageLocation> <-e> <testsuite> <output>
Or (for local test): <packageLocation> <-o> <ontologyURL1> <ontologyURL2>
Replace <testsuite> with one of Anatomy2010, Benchmark2010, Conference2010, or MLConference
A:\seals\sealshome>
```

Results of Local Evaluation Run

101	1.0	0.873	file:/C:/....
103	1.0	0.873	file:/C:/....
104	1.0	0.873	file:/C:/....
201	0.010	0.066	file:/C:/....
201-2	0.793	0.631	file:/C:/....
201-4	0.597	0.604	file:/C:/....

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Plans for 2nd SEALS campaign

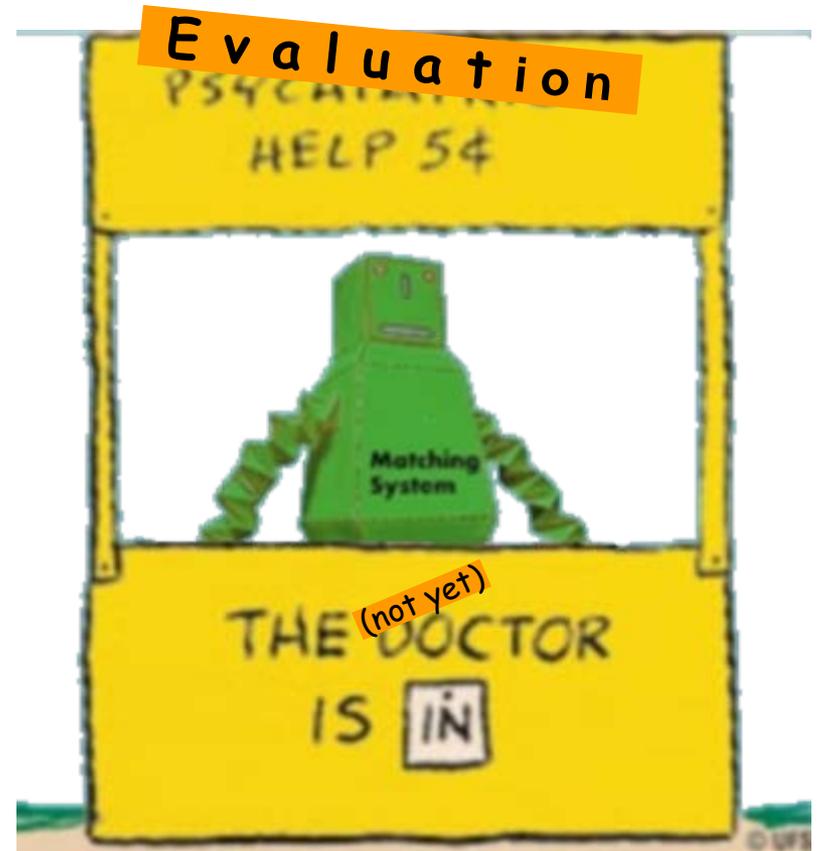
- OAEI 2011 at OM-workshop (ISWC 2011)
- Support preliminary tests and finally run tools on platform
 - Online evaluation service for preliminary testing
 - Client for running test and complete evaluation locally
 - We run tools on platform for generating final results
 - Use experiences for a fully automated approach in 2012
- More datasets under SEALS?
 - OAEI Directory track
 - Instance Matching Track
 - Track on Matching Linked Open Data Schemas

References

- Webpages:
 - <http://oaei.ontologymatching.org/2011/seals-eval.html>
tutorial for wrapping a matcher to be executed on the platform,
still partially **under construction**
 - <http://www.seals-project.eu/ontology-matching-evaluation-ui>
user interface of the online evaluation service
- Publications:
 - Euzenat et al.: Results of the ontology alignment evaluation initiative 2010, OM-2010
comprehensive overview on OAEI 2010 results
 - Trojahn et al.: Automating OAEI Campaigns (First Report), IWEST-2010
about using the online evaluation service in OAEI 2010

Contact me!

- Ontology Matching in SEALS-Booth
 - Mon 18:00-18:30
 - Tue 10:30-11:00
 - Tue 13:30-14:00
- It's for free!
- Email:
 - christian@informatik.uni-mannheim.de



Thanks!

Any Questions?