NLP Interchange Format (NIF)

http://nlp2rdf.org
NLP2RDF + NIF

- **NLP Interchange Format (NIF)** is an RDF/OWL-based format that allows to combine and chain several Natural Language Processing (NLP) tools in a flexible, light-weight way.

- **NLP2RDF** is a LOD2 project providing:
  - documentation
  - reference implementations of NIF
  - collaboration platform
  - tutorials / example source code
  - mailing list for questions and support
  - possible to join on http://nlp2rdf.org
NLP2RDF + NIF

- Motivation and comparison of other NLP frameworks
- URI design
- NLP domain vocabularies
- Applications
NLP2RDF - NIF Use Cases

Problem: NLP software is organized in pipelines (UIMA, Gate)

- Integration is done „hard-wired“ (Software has to be developed)
- For each tool and each framework an adapter has to be created (n*m)
- No ad-hoc integration
- Difficult to aggregate output
- Difficult to exchange single components
- Not robust: if step 6 of 20 steps fails no output is produced
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Table 3.1: Comparison of NLP architectures: “+” fully supported, “0” partially supported, “-” not supported.
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**Included in RDF/OWL as**
- **rdf:type**
- **rdfs:subClassOf**
- **links and mappings**

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**Intra-changeable, but not inter-changeable:**
Gate Plugin can not be used in UIMA

**Table 3.1:** Comparison of NLP architectures: “+” fully supported, “0” partially supported, “-” not supported.
NIF – Integration Architecture

[Diagram showing the integration architecture with NLP tools, NIF wrappers, and data sources like DBpedia, Wordnet, and RDF Model.]
Linked Data

The Semantic Web isn't just about putting data on the web. It is about making links, so that a person or machine can explore the web of data. With linked data, when you have some of it, you can find other, related, data.

Like the web of hypertext, the web of data is constructed with documents on the web. However, unlike the web of hypertext, where links are relationships anchors in hypertext documents written in HTML, for data they links between arbitrary things described by RDF. The URIs identify any kind of object or concept. But for HTML or RDF, the same expectations apply to make the web grow:

1. Use URIs as names for things
2. Use HTTP URIs so that people can look up those names.
3. When someone looks up a URI, provide useful information, using the standards (RDF*, SPARQL)
4. Include links to other URIs, so that they can discover more things.

Simple. In fact, though, a surprising amount of data isn't linked in 2006, because of problems with one or more of the steps. This article discusses solutions to these problems, details of implementation, and factors affecting choices about how you publish your data.

The four rules

I'll refer to the steps above as rules, but they are expectations of behavior. Breaking them does not destroy anything, but misses an opportunity to make data interconnected. This in turn limits the ways it can later be reused in unexpected ways. It is the unexpected re-use of information which is the value added by the web.

The first rule, to identify things with URIs, is pretty much understood by most people doing semantic web technology. If it doesn't use the universal URI set of symbols, we don't call it Semantic Web.

The second rule, to use HTTP URIs, is also widely understood. The only deviation has been, since the web started, a constant tendency for people to invent new URI schemes (and sub-schemes within the urn, scheme) such as LSIDs and handles and XRI and DOIs and so on, for various reasons. Typically, these involve not wanting to commit to the established Domain Name System (DNS) for delegation of authority but to construct
NIF – How to address Strings with URIs?

Version 1: offset_14406_14418_Semantic+Web
(easy to handle)

```
@prefix : <http://www.w3.org/DesignIssues/LinkedDataLinkedData.html#>
@prefix revyu: <http://purl.org/stuff/rev#>
:offset_14406_14418_Semantic+Web
  rev:hasComment
  "Hey Tim, good idea that Semantic Web!" .
```

Version 2: hash_4_12_79edde636fac847c006605f82d4c5c4d_Semantic+Web
(more stable)

```
@prefix : <http://www.w3.org/DesignIssues/LinkedDataLinkedData.html#>
@prefix revyu: <http://purl.org/stuff/rev#>
:hash_4_12_79edde636fac847c006605f82d4c5c4d_Semantic+Web
  rev:hasComment
  "Hey Tim, good idea that Semantic Web!" .
```
NIF - Combined RDF

NIF produced by SnowballStemmer
NIF produced by Stanford Parser
RDF merged from both tools
INTEGRATION
• NIF-1.0 provides
  • URI recipes to anchor annotation in documents
  • Ontologies to describe the relations between these URIs:
    – e.g. subString, String, Word, Sentence, Document
    – http://nlp2rdf.lod2.eu/schema/string/
    – http://nlp2rdf.lod2.eu/schema/sso/
  • Vocabularies for certain NLP tasks and domains
    – e.g. OLiA [Chiarcos 2008, 2010]
      http://nachhalt.sfb632.uni-potsdam.de/owl/
OLiA

Ontologies of Linguistic Annotation

OLiA Reference Model

- Morphosyntactic Category
- PronounOrDeterminer
  - Determiner
  - Demonstrative Determiner

- Pronoun
  - Attributive
  - Demonstrative Pronoun
  - PDAT (instance_of)

OLiA Reference Model

Terminology Repositories

Annotation Models
Currently 32 Annotation Models for 69 languoids available at:
http://nachhalt.sfb632.uni-potsdam.de/owl/

The ontologies can be instrumentalized to achieve parser, tagset, language and framework independence.
NIF RoadMap

• RoadMap:
  • NIF 1.0 is published and implementation has started
  • http://nlp2rdf.org allows to browse the implementations
  • Benchmarking of String URI properties (stability)
  • Interactive Tutorial challenges online
  • NIF 2.0-draft will be refined based on the experience gained during the implementation of NIF 1.0
  • Several organisations already use NIF (especially LOD2)
Contact

Address

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Institute of Computer Science
Department of Business Information Systems

Postfach 100920
04009 Leipzig
Germany

Project: http://lod2.eu
Presenter: http://bis.informatik.uni-leipzig.de/SebastianHellmann
NLP2RDF page: http://nlp2rdf.org

Thanks for your attention!
Advantages of RDF/OWL

- RDF makes data integration easy: URIref, LinkedData
- OWL is based on Description Logics (Guarded Fragment)
- Availability of open data sets (access and licence)
- Reusability of Vocabularies and Ontologies
- Diverse serializations for annotations: XML, Turtle, RDFa+XHTML
- Scalable tool support (Databases, Reasoning)
- Data is flexible and can produce indexes
Meaning Representation Language

Explicit Meaning

Semantic Gap

Existing structured knowledge is selected, disambiguated and integrated

WSD connects top and bottom

Each NLP layer is augmented with linguistic background knowledge

Backbone ontology

Plain Text

Implicit Meaning

LOD cloud

Wortschatz

DBpedia

WSD

Anaphoras

NER

Dependencies

Syntax

POS

Morphology

SSO

Meaning expressed in OWL
Knowledge Extraction with SPARQL

Classical approach:

- POS tag / Dependency parser (e.g. Stanford)
- create a rule/pattern language to extract knowledge

Lot's of home-made solutions and problems!
# Example:

A fish is any aquatic vertebrate animal that is covered with scales, and equipped with two sets of paired fins and several unpaired fins.

[fish] subClassOf [any aquatic vertebrate animal that is covered ...]

**Construct** { ?sub rdfs:subClassOf ?super } {

?is a penn:BePresentTense .

?is nlp:superToken ?is_any_aquatic_.

?is_any_aquatic_ a olia:VerbPhrase .


?animal nlp:cop ?is .


}