

KnowledgeStore

— Scalable Framework for Interlinking Text and Knowledge —

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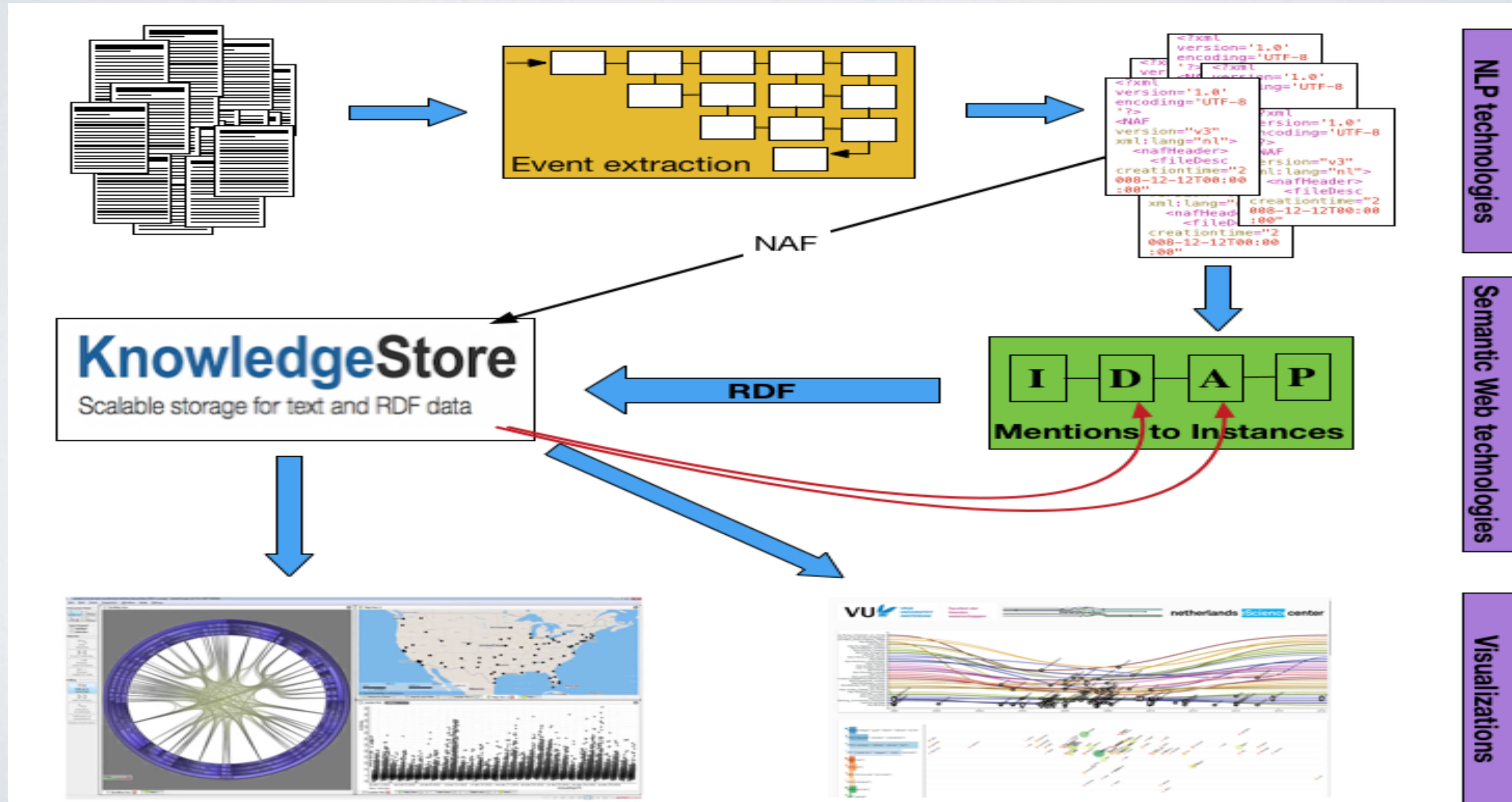
rospocher@fbk.eu :: [@marcorospocher](https://twitter.com/marcorospocher)



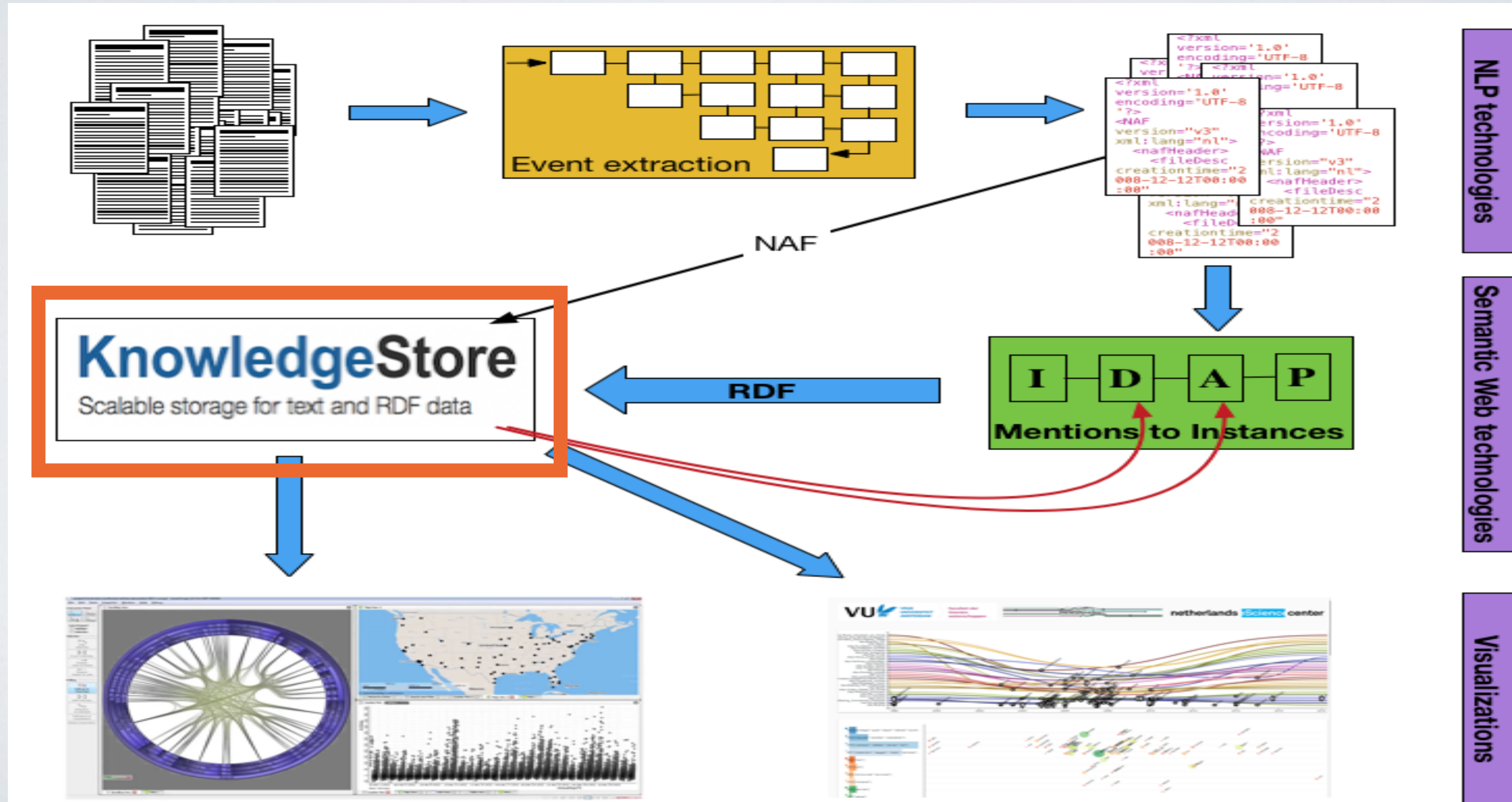
KnowledgeStore

- A scalable, fault-tolerant, and Semantic Web grounded storage system to jointly store, manage, retrieve, and query, both structured and unstructured data

KnowledgeStore



KnowledgeStore



KnowledgeStore

Motivating scenario

- Among a collection of news articles, a user is interested in retrieving all 2014 articles reporting statements of a 20th century US president where he is positively mentioned as “commander-in-chief”.

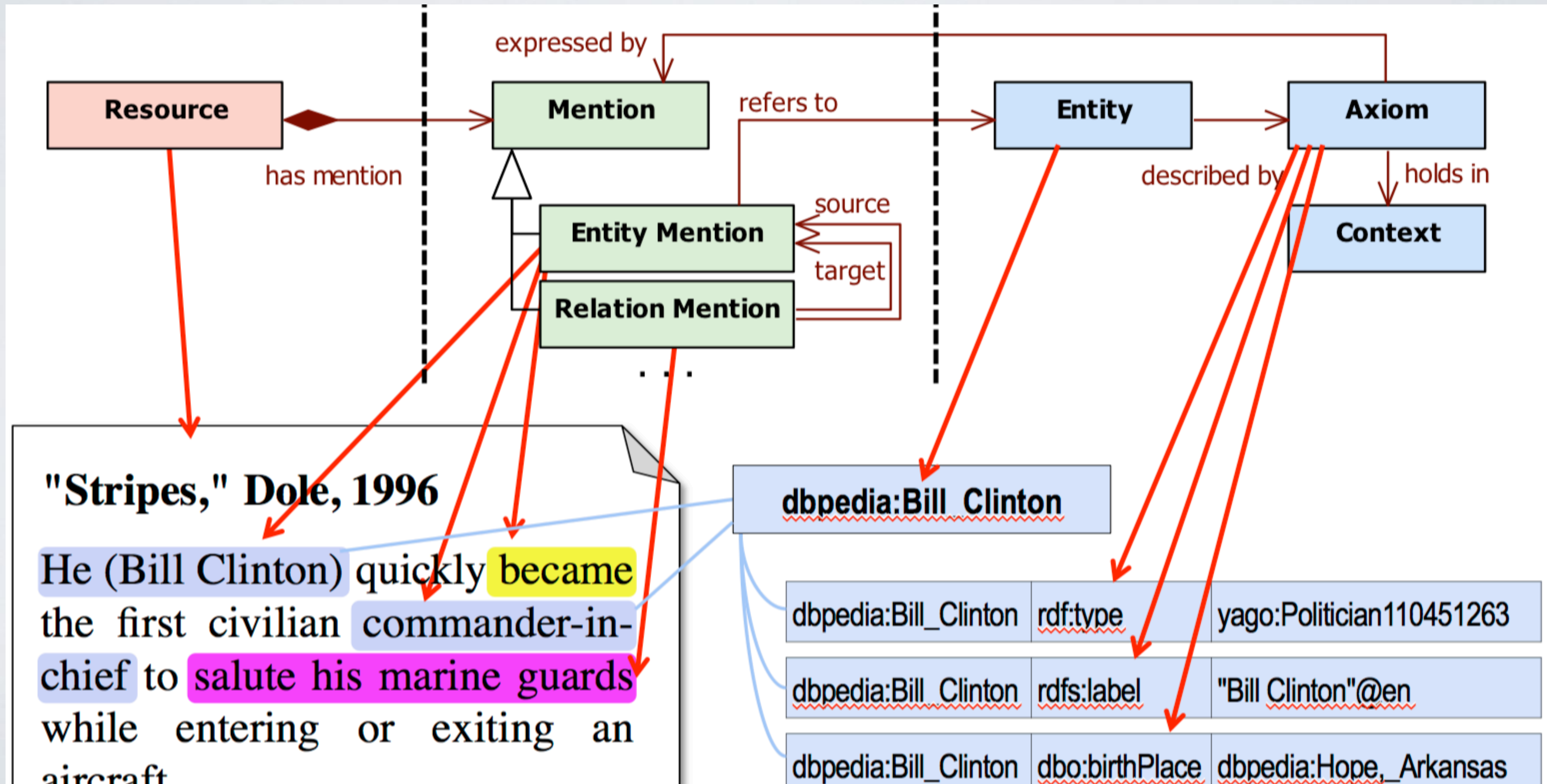
KnowledgeStore

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KnowledgeStore

In a nutshell



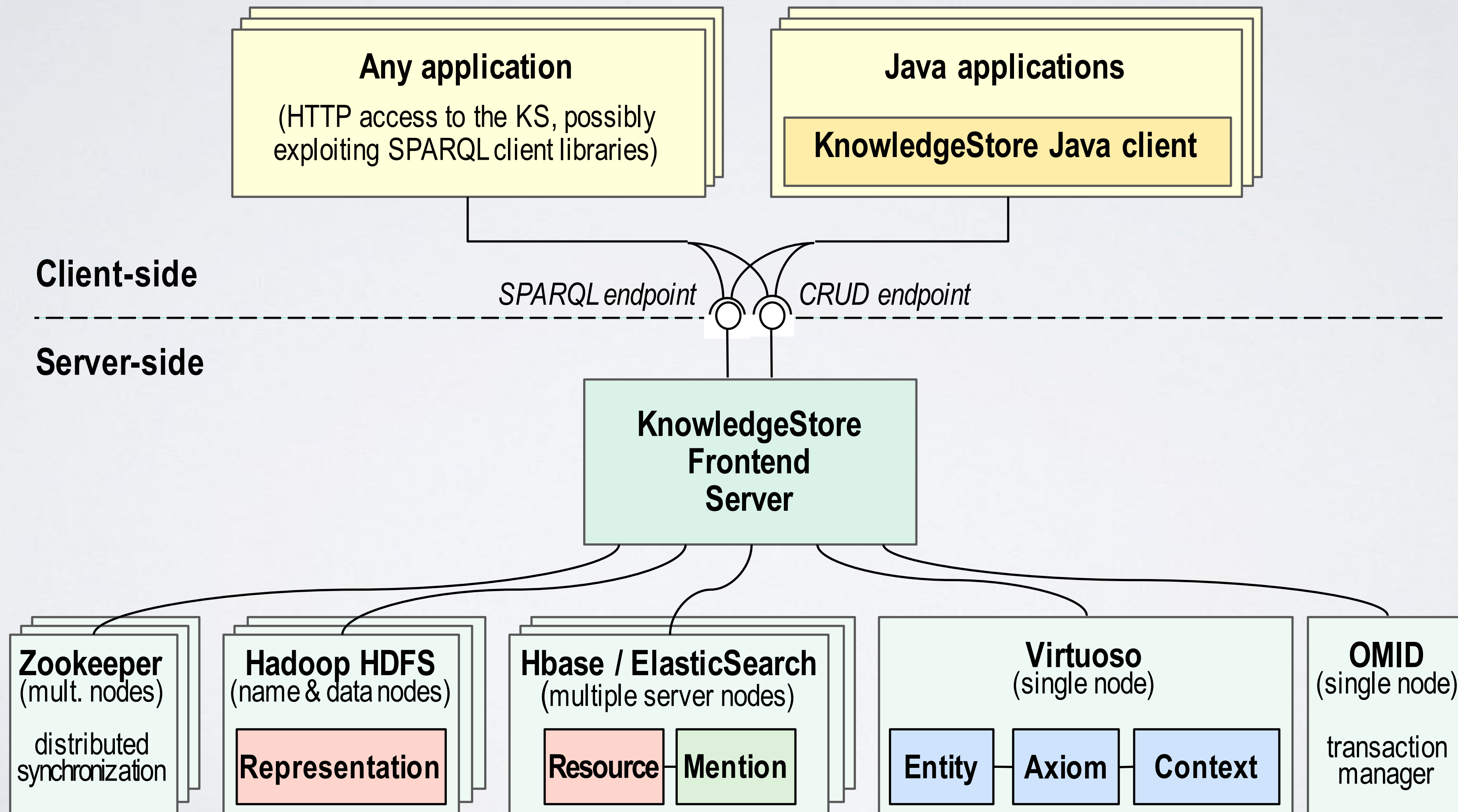
KnowledgeStore

Exploitation

- Enhanced applications (e.g., decision support systems)
- Developing, debugging, training, and evaluating NLP and knowledge processing tasks
- Reasoning on Extracted Information (e.g., on Events)
- Text Exploration

KnowledgeStore

Architectural View



KnowledgeStore

Looking through the glass box: the **User Interface**

KnowledgeStore UI

Lookup

SPARQL query

Reports ▾

KnowledgeStore/1.7-SNAPSHOT

This is the entry point of the KnowledgeStore Web API.

Please refer to the [KnowledgeStore Web site](#) and, in particular, to the [Web API reference documentation](#) for information on how to invoke it; an automatically generated [WADL descriptor](#) is also available.

A small UI can be used to explore the contents in the KnowledgeStore, either by [looking up specific URIs](#) or by [evaluating SPARQL queries](#) (refer to upper right menu).

System status: 41d2h21m uptime, 0% gc; 417/1074/816 MB memory used/peak/committed; 44/53/354728 threads active/peak/started

KnowledgeStore

Looking through the glass box: the **User Interface**

KnowledgeStore UI Lookup SPARQL query Reports

Resource text Download Select resource metadata Select entity (47) Select mention (312)

Fiat goes Hollywood

Aiming to win female buyers for its slow selling Idea small minivan, Fiat hired American actor George Clooney for an ad campaign that will appear on television and in newspapers across Europe.

Clooney, who often spends time at his house in Laglio, on Lake Como in the Italian Alps, has a passion for all things Italian, from food and wine to fashion.

In the 30-second TV commercial, a young woman drives an orange Idea along Lake Como's twisting roads. She stops at a villa, gets out of the car, opens the passenger door and walks away. Intrigued by the open door, a passing jogger - played by Clooney - gets into the car and is so impressed by its features that he lies back and rests. The woman reappears, locks the car's doors by remote control and traps Clooney inside.

The woman, played by New York actress Dara Tamanovich, then drives off with a triumphant smile and with Clooney still inside.

The ad's closing phrase is "George not included."

Roberto Zuccato, Fiat Auto's communication and institutional relations head, said Fiat wanted to highlight the attractiveness of the Idea's styling and standard equipment, and show that "no one can resist its charm."

The commercial was directed by Argentinean director Pucho Mentasti, who lives and works in Los Angeles, and has won top awards at the Cannes Advertising Festival in France.

Leo Burnett Worldwide created the commercial. Launched in Italy last month, it will be broadcast in other European countries this autumn.

Fiat was one of the first European automakers to use movie actors for television advertising.

Catherine Deneuve starred in the ad campaign for the first-generation Lancia Delta in September 1979. In the last five years, Fiat has used Harrison Ford to promote its Lancia Lybra and

Resource metadata

ID	<../4DKT-30W0-00S0-W39B.xml>
ks:hasMention	<..#char=0,4> <..#char=0,9> <..#char=10,19> <..#char=1004,1017> <..#char=1004,1050> <..#char=1004,1068> <..#char=1004,1081> <..#char=1004,1100>
ks:storedAs	ID <../4DKT-30W0-00S0-W39B.xml_file>

Lookup of a resource

KnowledgeStore

Looking through the glass box: the **User Interface**

The screenshot shows the KnowledgeStore UI interface. At the top, there is a navigation bar with 'KnowledgeStore UI', 'Lookup', 'SPARQL query', and 'Reports'. Below this, there is a search bar with the ID 'http://www.newsreader-project.eu/data/cars/2004/10/18/4DKT-30W0-00S0-W39B.xml#char=5,9' and a 'Lookup' button. The search results show '1 mention found'. The mention resource is excerpted as '<../4DKT-30W0-00S0-W39B.xml>' and contains the text 'Fiat goes Hollywood', with 'goes' highlighted in green. Below the excerpt, there is a table of 'Mention data' with various properties and their values.

Mention data	
ID	<../char=5,9>
ks:mentionOf	<../4DKT-30W0-00S0-W39B.xml>
nwr:esoRef	eso:Motion
nwr:eventClass	nwr:event_grammatical
nwr:factBank	NONE
nwr:framenetRef	<../Motion> <../Process_continue>
nwr:pos	nwr:pos_verb
nwr:pred	go
nwr:propbankRef	<../go.01>
nwr:tlink_to_tmx0	nwr:tlink_is_included
nwr:verbnetRef	<../escape-51.1> <../meander-47.7>
nwr:wordnetRef	<../ili-30-01835496-v> <../ili-30-01848718-v> <../ili-30-02685951-v>
nif:anchorOf	goes
nif:beginIndex	5
nif:endIndex	9
rdf:type	ks:Mention

Lookup of a mention

KnowledgeStore

Looking through the glass box: the **User Interface**

KnowledgeStore UI Lookup **SPARQL query** Reports ▾

```
SELECT DISTINCT ?event ?event_label ?year ?month ?day
WHERE {
  ?event a sem:Event, eso:JoiningAnOrganization .
  ?event rdfs:label ?event_label .
  ?event eso:employment-employer dbpedia:Kia_Motors .
  ?event sem:hasTime ?time .
  ?time owltime:inDateTime ?time_owl .
  ?time_owl owltime:year ?year; owltime:month ?month; owltime:day ?day .
}
ORDER BY ?year ?month ?day
```

Timeout s Display results Download as... ▾ [example query ▾](#)

SPARQL query

7 results in 29 ms

[show / hide query panel](#)

event	event_label	year	month	day
<..#ev31>	hiring	2006	8	1
<..#ev4>	hire	2006	8	1
<..#ev8>	hire	2010	1	13
<..#ev2>	hire	2010	1	14
<..#ev8>	hire	2010	1	14
<..#ev16>	hire	2012	8	10
<..#ev17>	hire	2012	8	10

KnowledgeStore

Looking through the glass box: the **User Interface**

The screenshot shows the KnowledgeStore UI interface. At the top, there are navigation tabs: "Lookup", "SPARQL query" (which is active), and "Reports". Below the tabs is a text area containing a SPARQL query. The query is as follows:

```
SELECT DISTINCT ?event ?event_label ?year ?month ?day
WHERE {
  ?event a sem:Event, eso:JoiningAnOrganization .
  ?event rdfs:label ?event_label .
  ?event eso:employment-employer dbpedia:Kia_Motors .
  ?event sem:hasTime ?time .
  ?time owltime:inDateTime ?time_owl .
  ?time_owl owltime:year ?year; owltime:month ?month; owltime:day ?day .
}
```

Below the query area, there are controls for "Timeout" (set to "s"), "Display results", and "Download as...". There is also a dropdown menu for "example query".

SPARQL query

Check out the UI demonstration video:
<https://youtu.be/YVOQaljLta4>

7 results in 29 ms show / hide query panel

event	event_label	year	month	day
<..#ev31>	hiring	2006	8	1
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<..#ev8>	hire	2010	1	13
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<..#ev8>	hire	2010	1	14
<..#ev16>	hire	2012	8	10
<..#ev17>	hire	2012	8	10

KnowledgeStore

Reasoning on Events

- Inferring Knowledge **not Explicitly Mentioned** in Text (powered by ESO)
- Example: “Kia has hired Peter Schreyer as chief design officer.”

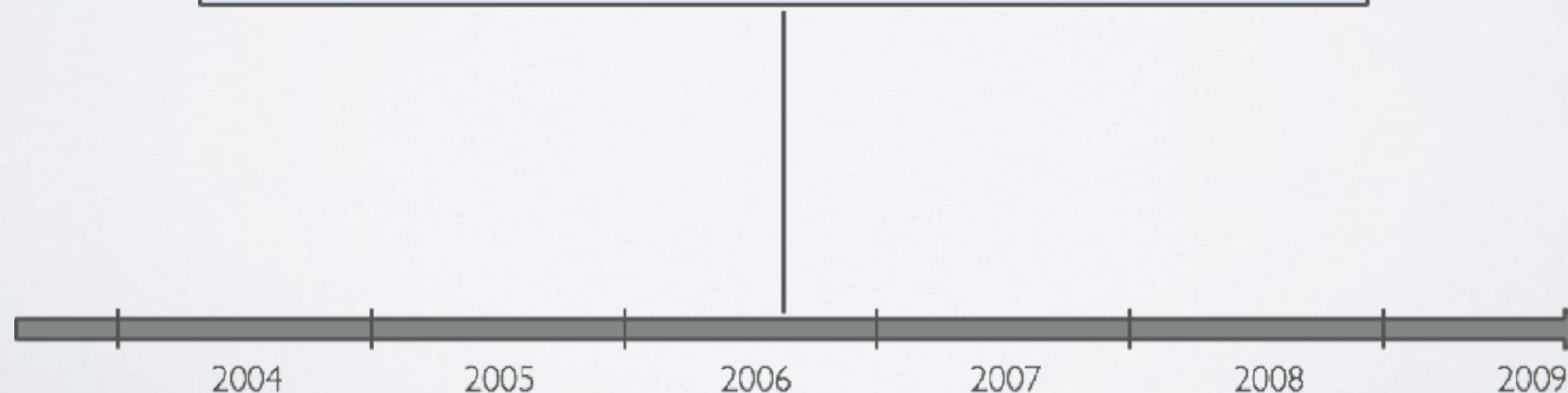
KnowledgeStore

Reasoning on Events

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- Example: “Kia has hired Peter Schreyer as chief design officer.”

At time: 2006/08/01

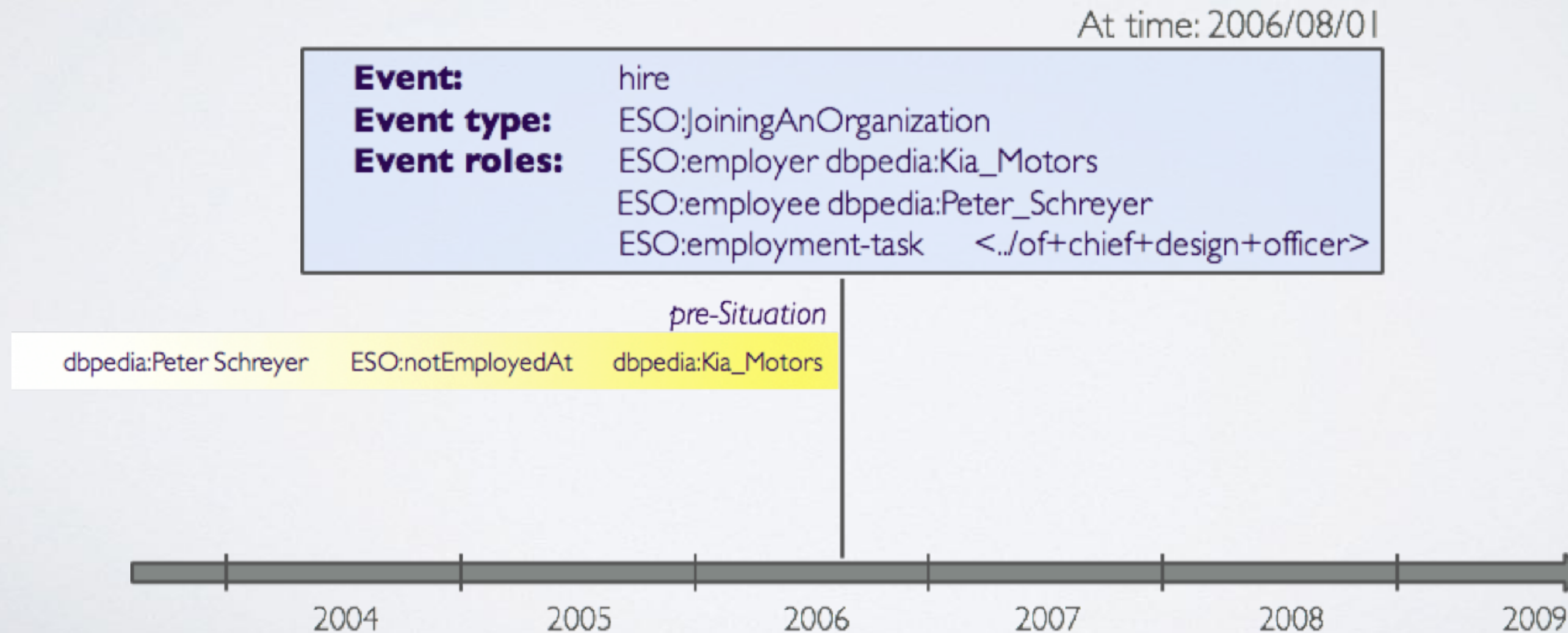
Event:	hire
Event type:	ESO:JoiningAnOrganization
Event roles:	ESO:employer dbpedia:Kia_Motors
	ESO:employee dbpedia:Peter_Schreyer
	ESO:employment-task <../of+chief+design+officer>



KnowledgeStore

Reasoning on Events

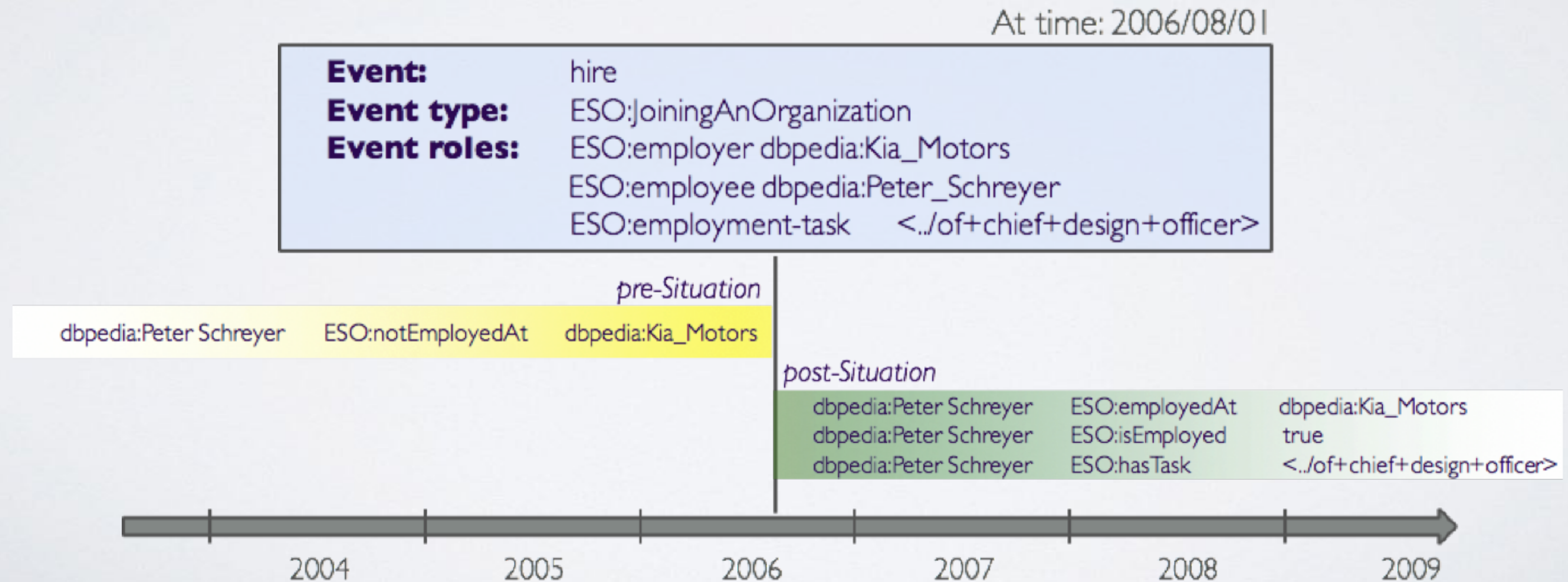
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KnowledgeStore

Reasoning on Events

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- Example: “Kia has hired Peter Schreyer as chief design officer.”



KnowledgeStore

Instances Populated During the Project

	MEANTIME	WikiNews (Ver. 1)	WikiNews (Ver. 2)	Cars (Ver. 1)	FIFA WorldCup	Dutch Parliament	Cars (Ver. 2)	Cars (Ver. 3)
Topic	General News	General News	General News	Automotive Industry	Sport, Football	Financial crisis	Automotive Industry	Automotive Industry
Period	2003-2013	2003-2013	2003-2015	2003-2013	2004-2014	around 2008/2009	2003-2013	2003-2015
News Providers	http://en.wikinews.org/	http://en.wikinews.org/	http://en.wikinews.org/	LexisNexis	LexisNexis, BBC, The Guardian	House of Parliament: news, debates, journals	LexisNexis	LexisNexis
Language	English	English	English	English	English	Dutch	English	English
Populated in	October 2015	February 2015	October 2015	December 2013	May 2014	June 2015	December 2014	October 2015
Pipeline Version	3.0	2.0	3.0	1.0	1.0	1.0-dutch	2.0	3.0

News Articles	120	18,510	19,755	63,635	212,258	597,530	1,259,748	2,316,158
Mentions	35,237	2,629,176	5,206,202	9,110,683	76,165,114	9,231,113	205,114,711	842,639,827

Events	3,333	624,439	632,704	1,783,991	9,387,356	5,383,498	25,156,574	42,296,287
Entities	339	45,592	40,314	428,700	858,982	111,579	1,967,150	2,263,156
Persons	82	19,677	17,617	199,999	403,021	43,546	729,797	895,541
in DBpedia	46	9,744	10,784	16,787	40,511	13,942	128,183	126,140
Organizations	172	15,559	14,358	187,842	431,232	44,139	947,262	1,139,170
in DBpedia	115	6,317	4,940	8,695	15,984	12,907	60,547	44,458
Locations	85	10,356	8,339	40,859	24,729	23,894	290,091	228,445
in DBpedia	81	7,773	7,369	11,364	16,372	11,167	88,695	76,341

Triples	95,219,534	105,675,519	110,861,823	316,034,616	240,731,408	188,296,316	535,035,576	1,240,774,944
from Mentions	1,046,544	9,700,585	16,688,833	46,359,300	136,135,841	65,631,222	439,060,642	1,146,601,954
from DBpedia	94,172,990	95,974,934	94,172,990	269,675,316	104,595,567	122,665,094	95,974,934	94,172,990
distilled from	DBpedia 2015	DBpedia 2015	DBpedia 2015	DBpedia 3.9	DBpedia 3.9	DBpedia 2014	DBpedia 2014	DBpedia 2015

KnowledgeStore

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News Providers	http://en.wikinews.org/	http://en.wikinews.org/	http://en.wikinews.org/	LexisNexis	LexisNexis, BBC, The Guardian	House of Parliament: news, debates, journals	LexisNexis	LexisNexis
Language	English	English	English	English	English	Dutch	English	English
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distilled from	DBpedia 2015	DBpedia 2015	DBpedia 2015	DBpedia 3.9	DBpedia 3.9	DBpedia 2014	DBpedia 2015	DBpedia 2015

KnowledgeStore

How to Know More...

- Publications

- [Main Reference] **The KnowledgeStore: a Storage Framework for Interlinking Unstructured and Structured Knowledge** (Francesco Corcoglioniti, Marco Rospocher, Roldano Cattoni, Bernardo Magnini, Luciano Serafini), In International Journal on Semantic Web and Information Systems, volume 11, 2015.
- **Interlinking Unstructured and Structured Knowledge in an Integrated Framework** (Francesco Corcoglioniti, Marco Rospocher, Roldano Cattoni, Bernardo Magnini, Luciano Serafini), in The 7th IEEE International Conference on Semantic Computing (ICSC), Irvine, CA, USA, 2013
- **Integrating NLP and SW with the KnowledgeStore** (Marco Rospocher, Francesco Corcoglioniti, Roldano Cattoni, Bernardo Magnini, Luciano Serafini) in ISWC 2014 Posters & Demonstrations Track, within the 13th International Semantic Web Conference (ISWC 2014), Riva del Garda, Italy, October 21, 2014
- **Integrating Unstructured and Structured Knowledge with the KnowledgeStore** (Marco Rospocher, Francesco Corcoglioniti, Roldano Cattoni, Bernardo Magnini, Luciano Serafini) in Proceedings of the Posters and Demos of the 19th International Conference on Knowledge Engineering and Knowledge Management (EKAW2014)
- **A Simple API to the KnowledgeStore** (Ian Hopkinson, Steve Maude, Marco Rospocher) in Proc. of ISWC Developers Workshop colocated with 13th Int. Semantic Web Conference (ISWC'14), Riva del Garda, Italy

- Deliverables

- **D6.1: KnowledgeStore Design** (June 2013)
- **D6.2.1: KnowledgeStore version 1** (December 2013)
- **D6.2.2: KnowledgeStore version 2** (February 2015)
- **D6.2.3: KnowledgeStore version 3** (October 2015)

- Demos

- **Demonstration video** showing accessing the KnowledgeStore through the UI - <https://youtu.be/YVOQaljLta4>

- Publicly Accessible KnowledgeStore Instance

- **Wikinews KnowledgeStore**: <https://knowledgestore2.fbk.eu/nwr/wikinews/ui>

KnowledgeStore

<http://knowledgestore.fbk.eu>



Data and Knowledge Management tools

PreMOn

PIKES

RDF_{pro}

KnowledgeStore

TeX-OWL

MoKi

CKR

The KnowledgeStore project

Project ▾

Documentation ▾

Ontologies ▾

Maven Reports ▾

Modules ▾

Contacts ▾

KnowledgeStore

Scalable storage for text and RDF data



Version: 1.7.1 | [KnowledgeStore](#) / Home

Overview

Despite the widespread diffusion of structured data sources and the public acclaim of the Linked Open Data initiative, a preponderant amount of information remains nowadays available only in unstructured form, both on the Web and within organizations. While different in form, structured and unstructured contents speak about the very same entities of the world, their properties and relations; still, frameworks for their seamless integration are lacking. The **NewsReader KnowledgeStore** is a scalable, fault-tolerant, and Semantic Web grounded storage system to jointly store, manage, retrieve, and semantically query, both structured and unstructured data. The KnowledgeStore plays a central role in the [NewsReader](#) EU project: it stores all contents that have to be processed and produced in order to extract knowledge from news, and it provides a shared data space through which NewsReader components cooperate.

Resources

- The KnowledgeStore [API JavaDoc](#) and [browsable source Code](#)
- Fork the KnowledgeStore through the [GitHub page](#)

KnowledgeStore

— Scalable Framework for Interlinking Text and Knowledge —

The Team

Roldano Cattoni, Francesco Corcoglioniti, Bernardo Magnini, Alessio Palmero Aprosio, Mohammed Qwaider, Marco Rospocher, Luciano Serafini

