

Serving Linked Data

Principles – Solutions - ClioPatria

Four rules of Linked Data

1. Use URIs to identify things (**Resources**).
2. Use HTTP URIs so that these things can be referred to and looked up ("**dereference**") by people and user agents
3. Provide useful information (i.e., a **structured description - metadata**) about the thing when its URI is dereferenced.
4. Include **links** to other, related URIs in the exposed data to improve discovery of other related information on the Web.



So that means that

When I ask for a URI

[dbpedia:Amsterdam](#)

I want some data back, *describing* that resource

Content negotiation

Reply based on preference expressed in HTTP request response header (Accept:)

```
GET /resource/Amsterdam HTTP/1.1
```

```
Host: dbpedia.org
```

```
Accept: text/html;q=0.5, application/rdf+xml
```

I'm ok with HTML...

...but I really prefer RDF

text/html

```
body onload="init();" about="dbpedia:Amsterdam">
<div id="header">
  <div id="hd_l">
    <h1 id="title">About: <a href="dbpedia:Amsterdam">Amsterdam</a></h1>
  <div id="homelink">
    <!--?vsp if (white_page = 0) http (txt); ?-->
  </div>
  <div class="page-resource-uri">
    An Entity of Type : <a href="http://dbpedia.org/ontology/City">city</a>,
    from Named Graph : <a href="http://dbpedia.org">http://dbpedia.org</a>,
    within Data Space : <a href="http://dbpedia.org">dbpedia.org</a>
  </div>
</div> <!-- hd_l -->
<div id="hd_r">
  <a href="http://wiki.dbpedia.org/Imprint" title="About DBpedia">
    
  </a>
</div> <!-- hd_r -->
</div> <!-- header -->
<div id="content">
```

<p>Amsterdam is de hoofdstad en grootste gemeente van Nederland. De stad, in het Amsterdams ook Mokum genoemd, ligt in de provincie Noord-Holland, aan de monding van de Amstel en aan het IJ. De naam van de stad komt van de ligging bij een in de 13e eeuw aangelegde dam in de Amstel. De plaats kreeg stadsrechten rond 1300 en groeide tot één van de grootste handelssteden ter wereld in de Gouden Eeuw.</p>

text/html

← → ↻ dbpedia.org/page/Amsterdam



About: Amsterdam

An Entity of Type : [city](#), from Named Graph : <http://dbpedia.org>, within Data Space : [dbpedia.org](#)



Amsterdam is de hoofdstad en grootste gemeente van Nederland. De stad, in het Amsterdams ook Mokum genoemd, ligt in de provincie Noord-Holland, aan de monding van de Amstel en aan het IJ. De naam van de stad komt van de ligging bij een in de 13e eeuw aangelegde dam in de Amstel. De plaats kreeg stadsrechten rond 1300 en groeide tot één van de grootste handelssteden ter wereld in de Gouden Eeuw.

Property	Value
dbpedia-owl:PopulatedPlace/areaMetro	<ul style="list-style-type: none">1815.0
dbpedia-owl:PopulatedPlace/areaTotal	<ul style="list-style-type: none">219.0
dbpedia-owl:PopulatedPlace/populationDensity	<ul style="list-style-type: none">3506.0
dbpedia-owl:abstract	<ul style="list-style-type: none">Amsterdam nebo též Amsterodam je hlavní město Nizozemska od roku 1808. Nesídí v něm však parlament, vláda ani královská rodina, tyto instituce mají své sídlo v Den Haag. V současnosti je největším nizozemským městem, jeho finančním a kulturním centrem. Ve městě žije 761 395 obyvatel (sčítání lidu z 31. května 2009), kteří se hlásí ke 177 různým národnostem (duben 2009). Amsterdam je jedním z měst konurbace Randstad.Amsterdam er hovedstaden i Nederland. Den er landets største by og ligger i provinsen Noord-Holland. Til tross for at den er titulær hovedstad i landet, er ikke Amsterdam residensby for kongeparet og regjeringen. Amsterdam har en bykjerne med mange kanaler, og ble grunnlagt rundt en demning i elven Amstel, som også har gitt byen navn . Byens flyplass Schiphol, som ligger i nabokommunen Haarlemmermeer, er en av de viktigste i Europa.Amsterdam – największe miasto Holandii i jej stolica konstytucyjna. Wszystkie instytucje rządowe oraz przedstawicielstwa obcych państw znajdują się w Hadze.Amszterdam (Amsterdam) a Holland Királyság fő- de nem székvárosa (a királynő, a parlament, és a kormány székhelye Hága . Az Amstel folyó torkolatánál, az IJ partján fekszik. 1813 óta Hollandia fővárosa. Nevének jelentése: „gát az Amstelen”. A várost a XVII-XVIII. századi iratok Amstelerdam néven említik.Amsterdam è la capitale e la maggiore città dei Paesi Bassi, nella provincia dell'Olanda Settentrionale. Il comune di Amsterdam ha 755.269 residenti di oltre 170 nazionalità, mentre la popolazione che risiede nell'area metropolitana è di circa 1.450.000 persone. L'area al centro della città circondata dai canali del XII secolo è dal 2010 Patrimonio dell'Unesco.아ム스텔라담 (오ランダ語:Amsterdam) は、오ランダ의 북홀란드州의基礎自治体(ヘーメンテ)であり、憲法上に規定された오ランダ의首都。오ランダ語での発音は「アムスタダム」に近い。政府、中央官庁、王室、国会など首都機能のほとんどはハーグにある。아ム스텔라담は商業および観光が中心である。암스테르담은 네덜란드의 수도이다. 그러나 행정의 중심지는 암스테르담으로부터 약 50 킬로미터 떨어진 헤이그에 있다. 원래 한적한 마을이었다가, 12세기경 암스텔 강 하구에 돌을 쌓아 도시가 건설되었는데, 암스테르담이라는 지명은 여기에서 유래되었다. 16세기에는 무역항으로 유럽 굴지의 도시로 발전하였다. 지금은 네덜란드 최대의 도시이자 경제 문화의 중심 도시로 성장했다. 암스테르담 중 알역 건물은 도교 역 및 서울역 건물의 모델이 되었다고 한다. 관광 및 운하로 유명하며, 마약 합법화와 홍등가로 유명한 환락의 도시이다. 이 도시는 자전거를 타는 사람들이 유난히 많은 것으로 알려져 있다. 2008년 1월 1일 현재 인구는 136만명에 이르고 있다.Амстердам — столиця Нідерландів. Розташований в провінції Північна Голландія в гирлі річки Амстел. Амстердам сполучений з Північним морем каналом.阿姆斯特丹 (/) 是荷兰首都及最大城市，位于该国西部省份北荷兰省。根据2009年1月的统计数据，这座城市人口达747,200人，而

application/rdf+xml

```
<rdf:Description rdf:about="dbpedia:Amsterdam">  <rdf:type
  rdf:resource="http://schema.org/City" />
  <rdf:type rdf:resource="http://dbpedia.org/ontology/City" />
  <rdf:type rdf:resource=
  "http://dbpedia.org/class/yago/GeoclassCapitalOfAPoliticalEntity" />
  <rdf:type rdf:resource="http://dbpedia.org/ontology/Place" />  <rdf:type
  rdf:resource="http://dbpedia.org/class/yago/CitiesInTheNetherlands" />
  <rdf:type
  rdf:resource="http://dbpedia.org/class/yago/PortCitiesAndTownsInTheNet
  herlands" />
  <rdf:type rdf:resource=
  "http://dbpedia.org/class/yago/PortCitiesAndTownsOfTheNorthSea" />
  <rdf:type rdf:resource=
  "http://umbel.org/umbel/rc/Location_Underspecified" />
  <rdf:type rdf:resource="http://dbpedia.org/ontology/Settlement" />
```

...

application/x-turtle

```
<dbpedia:Amsterdam> <dbprop:/subdivisionName> "Amsterdam"@en .  
  <dbprop:/aprSun> "183"^^<http://www.w3.org/2001/XMLSchema#int> .  
  <http://www.w3.org/2000/01/rdf-schema#comment> "Amsterdam \u2013 najwi\u0119ksze miasto Holandii i jej  
  stolica konstytucyjna. Wszystkie instytucje rz\u0105dowe ...."@pl .  
  <http://dbpedia.org/ontology/timeZone> <dbpedia:Central_European_Summer_Time> .  
  <http://xmlns.com/foaf/0.1/name> "Amsterdam"@en .  
  <http://www.georss.org/georss/point> "52.3730555555555 4.89222222222222"@en .  
  <dbprop:/yearSun> "1662"^^<http://www.w3.org/2001/XMLSchema#int> .  
  <http://dbpedia.org/ontology/leaderTitle> "Secretary"@en .
```

....

What actually should happen

GET /resource/Amsterdam HTTP/1.1

Host: dbpedia.org

Accept: text/html;q=0.5, application/rdf+xml

GET /data/Amsterdam HTTP/1.1

Host: dbpedia.org

Accept: text/html;q=0.5, application/rdf+xml

HTTP/1.1 303 See Other

Location: <http://dbpedia.org/data/Amsterdam>

Vary: Accept

HTTP/1.1 200 OK

Content-Type: application/rdf+xml;charset=utf-8

```
<?xml version="1.0"?>
```

```
<rdf:RDF
```

```
  xmlns:units="http://dbpedia.org/units/"
```

```
  xmlns:foaf="http://xmlns.com/foaf/0.1/"
```

```
  xmlns:geon="http://www.geonames.org/ontology#"
```

```
  xmlns:rdfs="http://www.w3.org/2000/01/rdf-
```

The Treachery of Documents



The image shows a screenshot of the English Wikipedia page for Shanghai. The browser address bar shows "en.wikipedia.org/wiki/Shanghai". The page title is "Shanghai" and it is identified as a "Municipality". The article text describes Shanghai as the largest city by population in the PRC, a global city, and a major financial center. It mentions its location on the Yangtze River Delta and its history as a major administrative, shipping, and trading town. The article also notes its role as a center of commerce and its decline after the Communist Party takeover in 1949, followed by a re-development in the 1990s. A table of contents is visible on the right side of the article, listing sections from Etymology and names to Public transport. On the far right, there is a gallery of images showing the Pudong skyline, Yu Garden, China Pavilion, Expo Axis, neon signs on Nanjing Road, and The Bund, along with a map of China highlighting Shanghai's location.


<http://en.wikipedia.org/wiki/Shanghai>

Ceci n'est pas Shanghai

← → ↻ dbpedia.org/page/Shanghai ☆

About: Shanghai

An Entity of Type : [ThÃ nh phÃ trÃ »+c thuÃ »c trung /E°E;ng \(Trung QuÃ »c\)](#), from Named Graph : <http://dbpedia.org>, within Data Space : <dbpedia.org>



Shanghai of Sjanghai is de grootste stad van China. De gemeente is sinds 2005 een van de vijf steden in China die de status van nationale centrale stad hebben. Tevens is Shanghai qua inwoneraantal de grootste gemeente ter wereld en is het een van de grootste metropolen ter wereld.

Property	Value
dbpedia-owl:PopulatedPlace/areaTotal	6340.5
dbpedia-owl:abstract	<ul style="list-style-type: none"> Shanghai je s 19 210 000 obyvateli (2009) nejlidnatější město Číny a významné hospodářské centrum této země. Rozkládá se při ústí řeky Jang-c'-ťiang do Východočínského moře a od roku 2004 vystřídala s ročním obrátem nákladu 380 milionů tun Rotterdam na pozici největšího přístavu světa. Šanghaj náleží mezi čtveřici měst se zvláštním statutem, která jsou v rámci ČLR postavena na roveň provinciím. 上海市 (シヤンハイし、中国語: 上海市、英語: Shanghai) は、中華人民共和國の直轄市である。世界有数の世界都市であり、同国の商業・金融・工業・交通などの中心の一つである。2012年には、アメリカのシンクタンクが公表したビジネス・人材・文化・政治などを対象とした総合的な世界都市ランキングにおいて、世界21位の都市と評価されており、特にビジネス分野では世界7位と高評価を得た。2011年5月時点の常住人口は2,300万人を超えており、市内総生産は1兆9,196億元(約26兆円)であり、首都の北京市を凌ぎ、同国最大である。国務院により国家中心都市の一つに指定されている。略称は滬 (簡体字: 沪 / コフ) だが、古称の申 (しん: ション) も用いられる。 상하이는 중국 동부의 항 강(長江)하구에 있는 도시이다. 중국 현대 경제의 성장로 널리 알려졌지만 이 도시는 중국에서 가장 중요한 문화, 상업, 금융, 산업, 통신의 중심지이기도 하다. 행정상, 상하이는 지방 수준의 위치인 중화중화국의 자치제이다. 상하이는 세계에서 가장 번잡한 항구 중 하나인데, 2005년에는 가장 큰 화물항구가 되었다. 원래는 어촌이었던 상하이는 20세기에 와서 중국에서 가장 중요한 도시가 되었고, 대중문화의 중심지가 되었다. 19세기 말과 20세기 초에 상하이는 뉴욕과 런던 다음의 순위로 세계에서 세 번째로 큰 금융 중심지가 되었고 국동의 가장 큰 상업도시가 되었다. 1949년 공산국가가 된 이후로 상하이는 중앙 정부의 무거운 세금, 외국인 투자의 중지 때문에 쇠진(衰頹)했다. 상하이는 시장 경제의 공산화에 따라서 1992년 상하이는 재개발되었다. 상하이는 지금 초기 개발가들이 선전과 광저우를 능가하고 있고 중국 경제 성장을 이끌어가고 있다. Шанхай — місто на сході Китайської Народної Республіки, розташоване біля гирла річки Хуанпу на узбережжі Східно-Китайського моря. Автомобільний та залізничний вузол, великий порт (у 2007 році вантажообіг складав близько 560 мільйонів тонн). Найбільше місто КНР за чисельністю населення. Територія міста з прилеглими околицями виділена в самостійну адміністративну одиницю центрального підпорядкування. 上海市，简称沪，别称申，中华人民共和国直辖市，国家中心城市。上海位于中国南北弧形海岸线中部，长江三角洲最东部。上海东向东海，隔海与日本九州岛相望，南濒杭州湾，西部与江苏、浙江两省相接，最北部为处于长江入海口中的崇明岛。上海是移民城市，常住人口逾2300万，流动人口近40%。江南的吴越传统与移民带入的各地文化融合，逐渐形成了特有的海派文化。先秦至元代，上海渐成为重要的粮、盐产地。明代起，上海发展为重要的棉纺织基地。1843年开埠后，移民从各地涌入，上海凭借独特的地理和政治环境迅速崛起，对中国近现代科技文化与工商业发展产生了很大影响，在中国近代史上有重要地位，“为中外观瞻之所系”。1949年以后，上海是中国大陆地区最重要的工商业与制造业基地，并于1990年起浦东开发开放，2005年设立国家综合配套改革试验区。现在，上海是中国大陆的商业与经济中心，地区生产总值在中国城市中居第一位，同时也是铁路与航空枢纽，其港口为世界最大的集装箱港。商贸流通、金融、信息、制造等为上海最重要的产业。上海正致力于建设成为国际金融与航运中心。 Shanghai is the largest city by population of the People's Republic of China (PRC) and the largest city proper by population in the world. It is one of the four province-level municipalities of the PRC, with a total population of over 23 million as of 2010. It is a global city, with influence in commerce, culture, finance, media, fashion, technology, and transport. It is a major financial center and the busiest container port in the world. Located in the Yangtze River Delta in eastern China, Shanghai sits at the mouth of the Yangtze River in the middle portion of the Chinese coast. The municipality borders Jiangsu and Zhejiang Provinces to the west, and is bounded to the east by the East China Sea. Once a fishing and textiles town, Shanghai grew in importance in the 19th century due

<http://dbpedia.org/page/Shanghai>

Ceci n'est pas Shanghai



http://farm1.staticflickr.com/225/474369474_b3f250bace.jpg

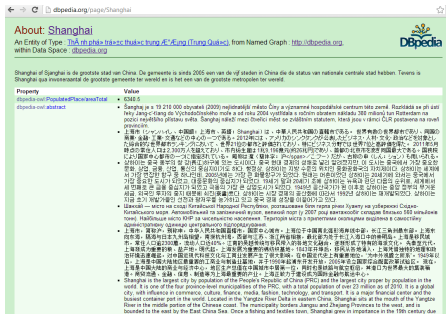
Ceci n'est pas Shanghai

photo: Flickr/Keith Marshall

Information Resource vs non-Information resource



<http://en.wikipedia.org/wiki/Shanghai>



dbpedia:Shanghai

<http://dbpedia.org/page/Shanghai>



http://farm1.staticflickr.com/225/474369474_b3f250bace.jpg

Countermeasure: 303 redirect

Accept: text/html;q=0.5, application/rdf+xml

1 GET http://example.org/victor

```
graph TD; A[1 GET http://example.org/victor] <--> B[HTTP/1.1 303 Location: http://example.org/victor.rdf]; B <--> C[2 GET http://example.org/victor.rdf]; C <--> D[http://example.org/victor.rdf]; E[http://example.org/victor.html] --- D;
```

2 GET http://example.org/victor.rdf

HTTP/1.1 303
Location: http://example.org/victor.rdf

http://example.org/victor.html

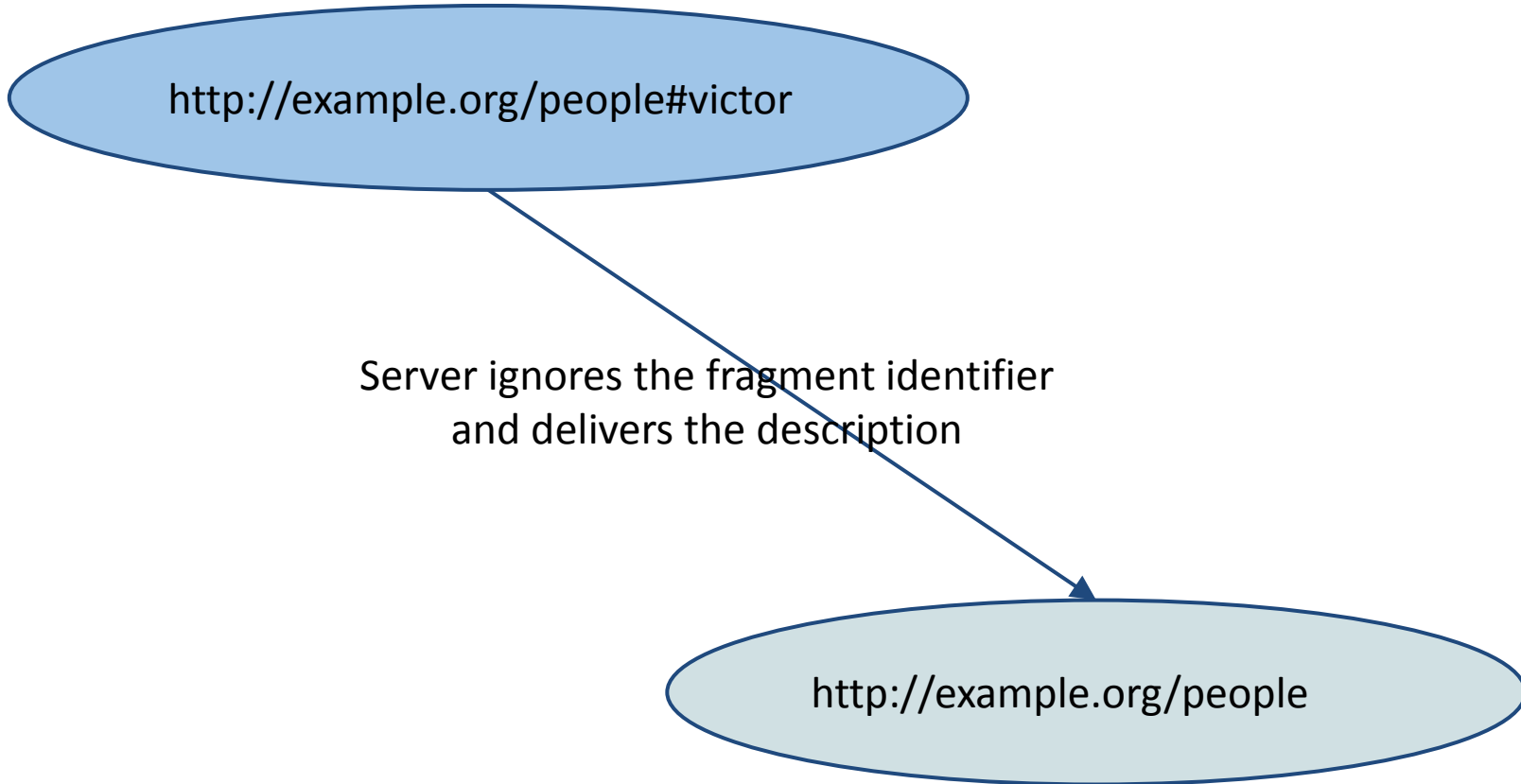
http://example.org/victor.rdf

Countermeasure: hash URIs

<http://example.org/people#victor>

Server ignores the fragment identifier
and delivers the description

<http://example.org/people>

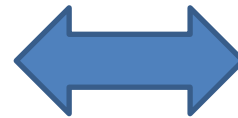


Hash vs. 303

303 require two HTTP requests

Hash retrieves entire document

Hash better for smaller
datasets and vocabularies



303 better for
larger datasets

Which part of the graph?

Concise bounded description

This notion is also known as "the bnode-closure of a resource"



Symmetric Concise bounded description

is similar to cbd, but includes triples with both URI as subject and object.



CBD vs SCBD

```
dbpedia:Amsterdam dbprop:subdivisionName "Amsterdam"@en .  
dbprop:aprSun "183"^^<http://www.w3.org/2001/XMLSchema#int> .  
dbprop:timeZone dbpedia:Central_European_Sumer_Time .  
foaf:name "Amsterdam"@en .  
georss:point>"52.37305555555555 4.892222222222222"@en .  
dbprop:leaderTitle "Secretary"@en .
```

```
dbpedia:Johan_Cruyff dbpedia-owl:birthPlace dbpedia:Amsterdam ;  
dbpprop:cityofbirth dbpedia:Amsterdam .  
dbpedia:Heineken_International dbpprop:location dbpedia:Amsterdam .
```

Publishing Linked Data

Recipes for publishing Linked Data

1. Serving Linked Data as Static RDF/XML Files
2. Serving Linked Data as RDF Embedded in HTML Files
3. Serving RDF and HTML with Custom Server-Side Scripts
4. Serving Linked Data from Relational Databases
5. Serving Linked Data by Wrapping Existing Application or Web APIs
6. Serving Linked Data from RDF Triple Stores

1. Serving Linked Data as Static RDF/XML Files

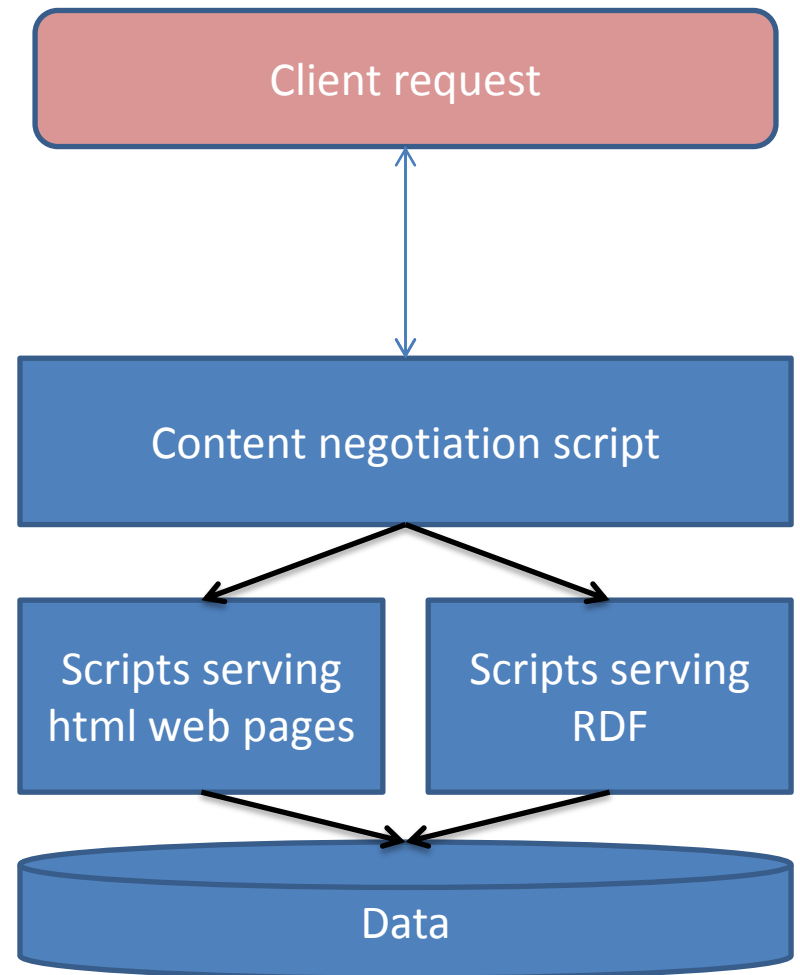
- “Just” host a .rdf file on your server, describing all of your RDF
 - Include correct MIME type

2. Serving Linked Data as RDF Embedded in HTML Files (RDFa)

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML+RDFa 1.0//EN"
  "http://www.w3.org/MarkUp/DTD/xhtml-rdfa-1.dtd">
<html xmlns="http://www.w3.org/1999/xhtml"
  xmlns:foaf="http://xmlns.com/foaf/0.1/"
  xmlns:dc="http://purl.org/dc/elements/1.1/"
  version="XHTML+RDFa 1.0" xml:lang="en">
<head>
  <title>John's Home Page</title>
  <base href="http://example.org/john-d/" />
  <meta property="dc:creator" content="Jonathan Doe" />
  <link rel="foaf:primaryTopic" href="http://example.org/john-d/#me" />
</head>
<body about="http://example.org/john-d/#me">
  <h1>John's Home Page</h1>
  <p>My name is <span property="foaf:nick">John D</span> and I like
    <a href="http://www.neubauten.org/" rel="foaf:interest"
      xml:lang="de">Einstürzende Neubauten</a>.
  </p>
</body>
</html>
```

3. Serving RDF and HTML with Custom Server-Side Scripts

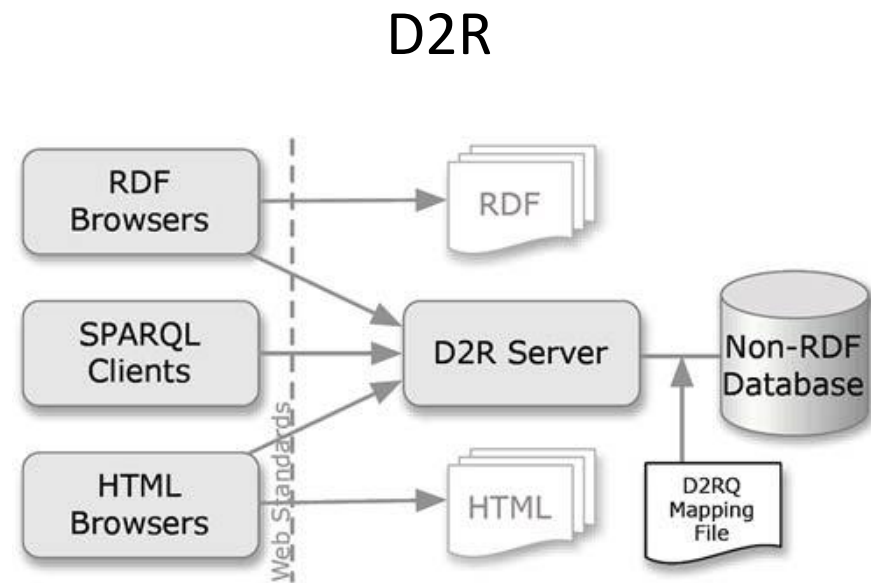
- PHP (ARC)
- Any other server-side scripting language



4. Serving Linked Data from Relational Databases

Some software mapping
relational database
tables to triples

D2R, Triplify, Virtuoso

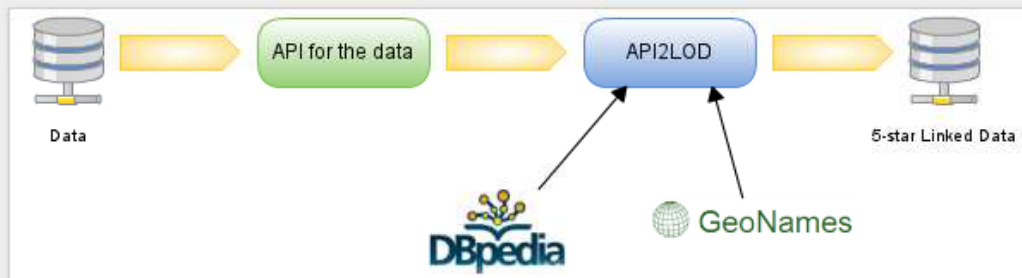


5. Serving Linked Data by Wrapping Existing Application or Web APIs



Welcome to api2lod.appspot.com!

API2LOD ("Happy to LOD") is a tool that facilitates exposing the content of data API onto the Web as Linked Data. This tool is available both as a downloadable servlet and an hosted service. There are several linker services which connect the data to other data sets.



6. Serving Linked Data from RDF *Triple Stores*



Sesame
Virtuoso
Apache Jena
Fuseki
OWLIM

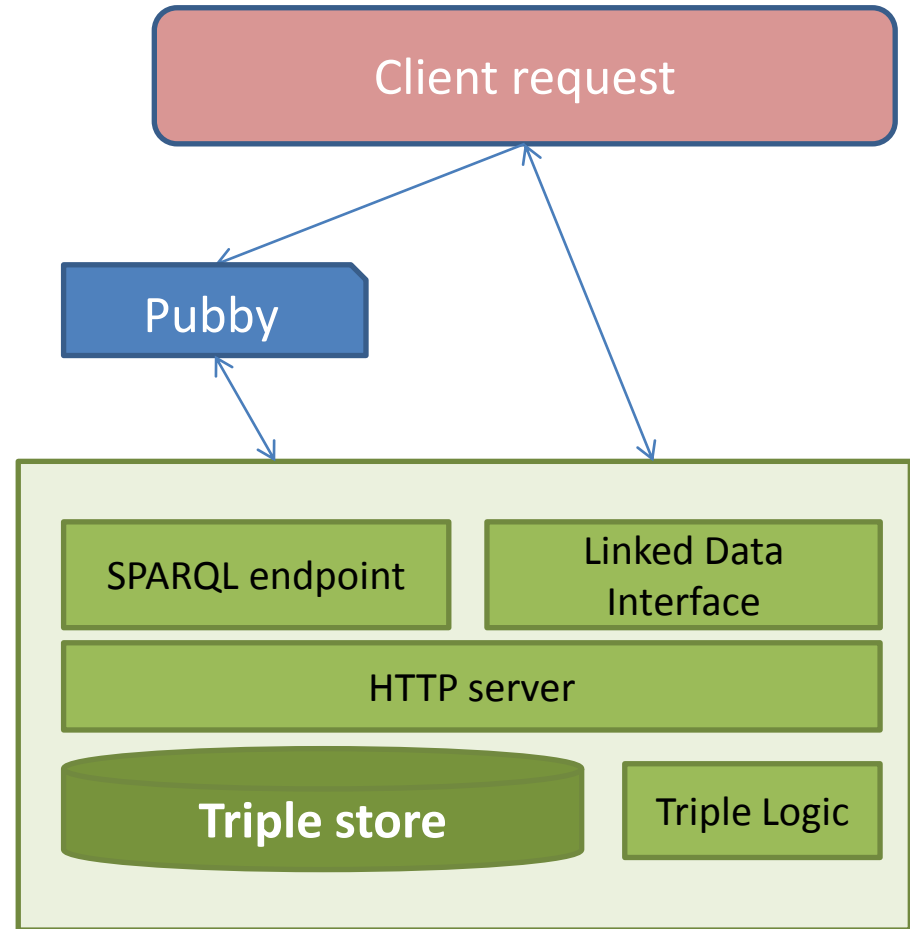


4Store

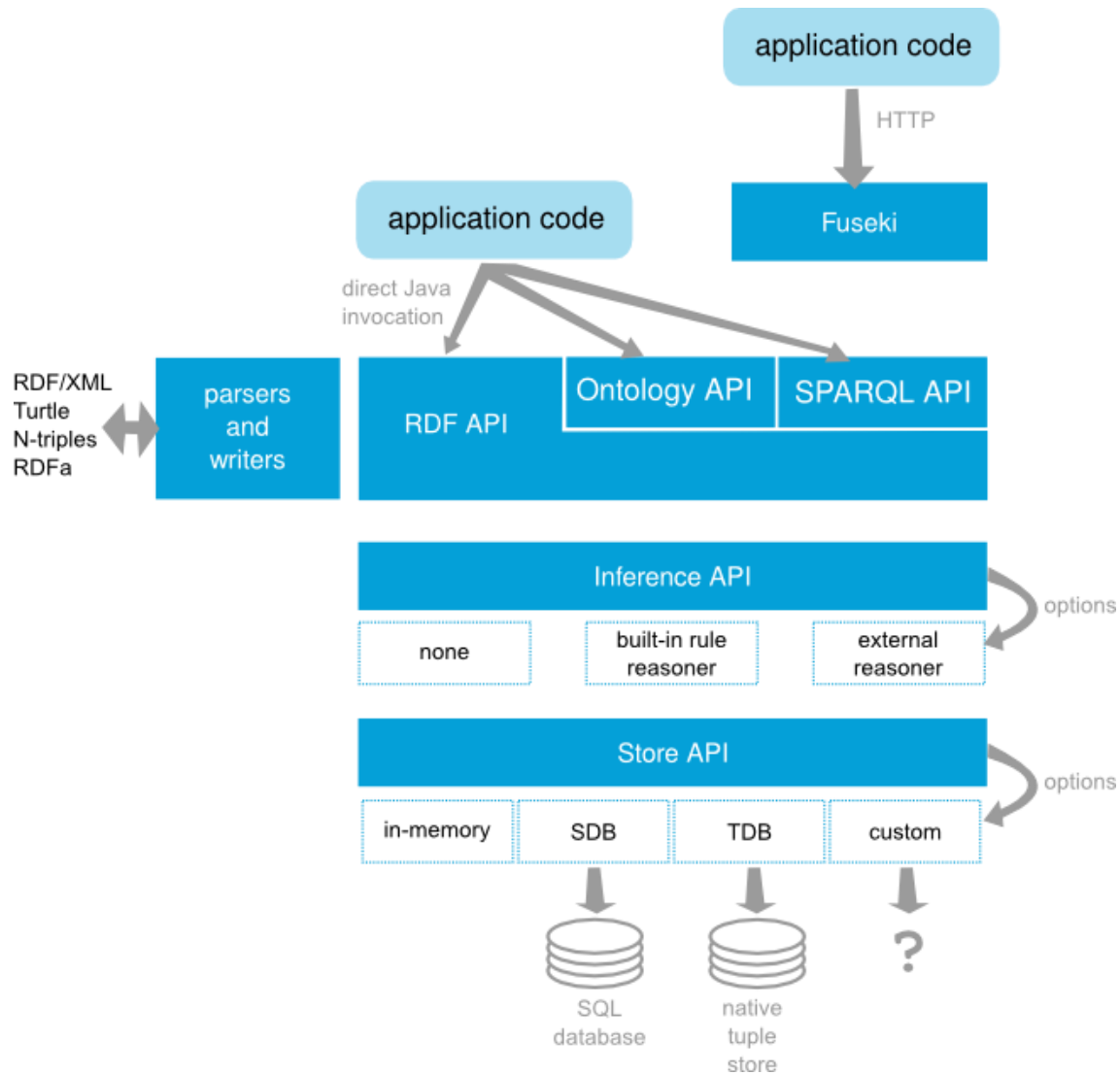


SWI Prolog

ClioPatria



Apache Jena



Elements of a Linked Open Data Stack

Using: Mashups

Mashups combine multiple datasets to create a new service, visualisation or information.

Using: Search

Linked data search engines allow search across the web of data. Conventional search may present information derived from linked data.

Using: Productivity

Linked data facilitates data **integration** for business intelligence or research.

Storing and publishing

Linked data can be published in simple flat files on a web server, in databases with a translation layer, or in specialised 'triple stores' built to store and share linked data. Publishing platforms understand requests for linked data & return it formatted as RDF.

Querying: SPARQL

SPARQL Protocol and RDF Query Language provides a way to run structured queries over linked data datasets. SPARQL servers expose linked open data to be queried.

Representing: Vocabularies

Vocabularies provide lists (and definitions) of common terms that can be used to describe the things and relationships in a dataset.

Representing: Ontologies

Ontologies are vocabularies that record the logical relationships between their terms and support reasoning.

Interchanging: RDF

Resource Descriptor Framework (RDF) is a *model* for representing data as 'triples'. RDF can be serialised into a range of different file formats, including RDF-XML and text-based Turtle or N3 syntax.

Identifying: URLs

Using HTTP Uniform Resource Locators (URLs) means that (a) data can be looked up across the Internet; (b) decisions about 'namespaces' for data are managed through the Domain Name System (DNS).

Transporting: HTTP (The World Wide Web)

Data is hosted on servers that can talk Hypertext Transfer Protocol (HTTP) to each other and to browsers in order to exchange data across the Internet.

Licensing: open data
Open data is made available under licenses (or is placed in the public domain) so that others can use and build upon it, free of legal restrictions. Open standards for data files and interchange are used also.

Elements of the Linked Open Data Stack (revision 3) - 5th May 2011. CC BY-SA-NC

Draft sketch by Tim Davies (@timdavies / tim@practicalparticipation.co.uk) for IKM Working Paper on Linked Open Data for Development. Comments welcome. Search 'linked open data stack' on <http://www.opendataimpacts.net> for latest version.

Idea based on Semantic Web Stack at http://en.wikipedia.org/wiki/Semantic_Web_Stack

ClioPatria

What is ClioPatria 3.0?

- A Prolog RDF store
- A Prolog-based web-server
- With SPARQL endpoint
- With LOD (Linked Open Data) service
- With development tools
- With an extension mechanism (CPACK)
- ...

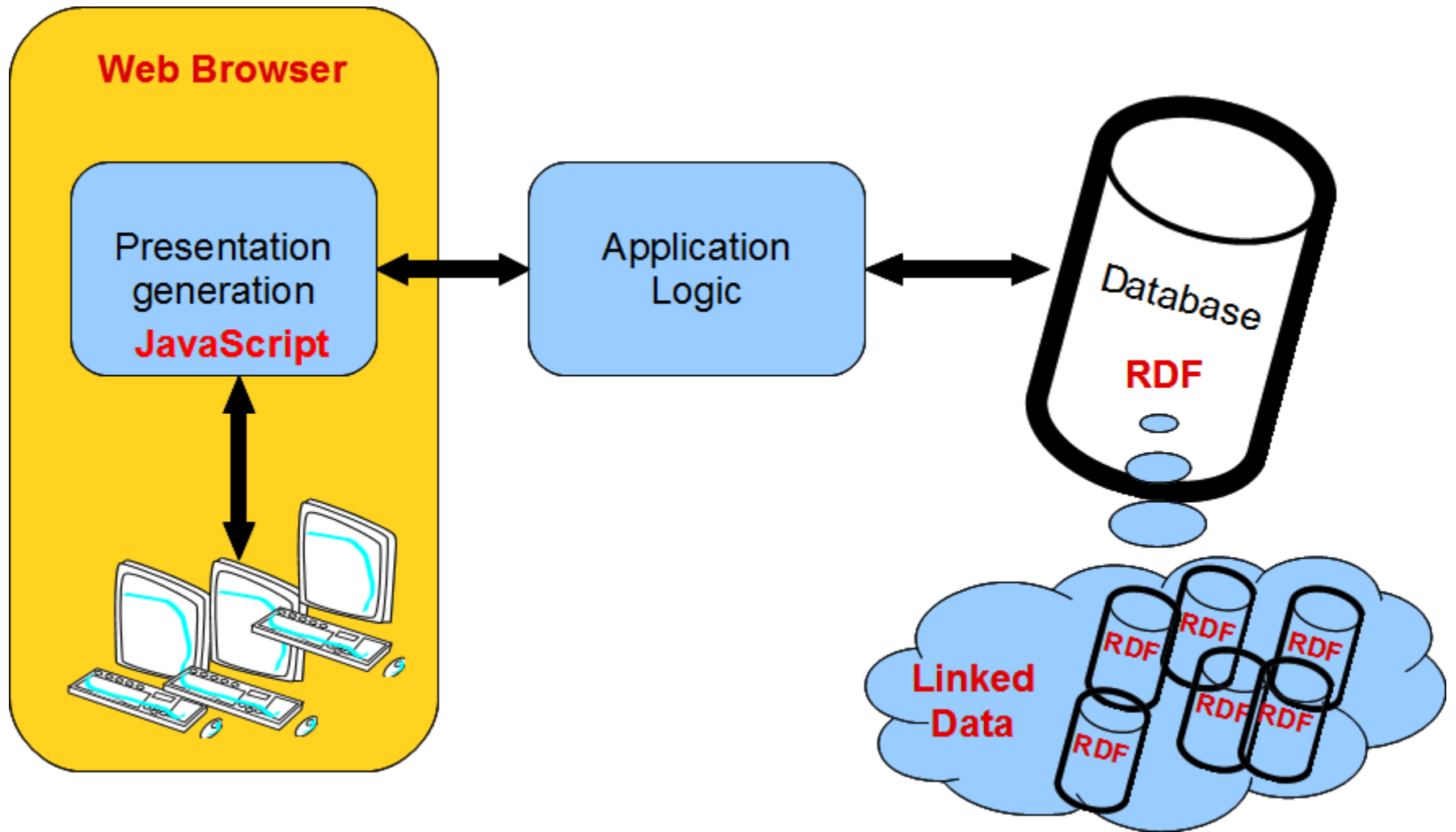
Aims of ClioPatria 3.0

- Provide an easy to use RDF platform
 - Simple installation
 - Simple exchange of extensions (CPACK)
 - Intuitive usage
 - Web front-end
 - Prolog interactive access
- Intended usage
 - Application development
 - Study

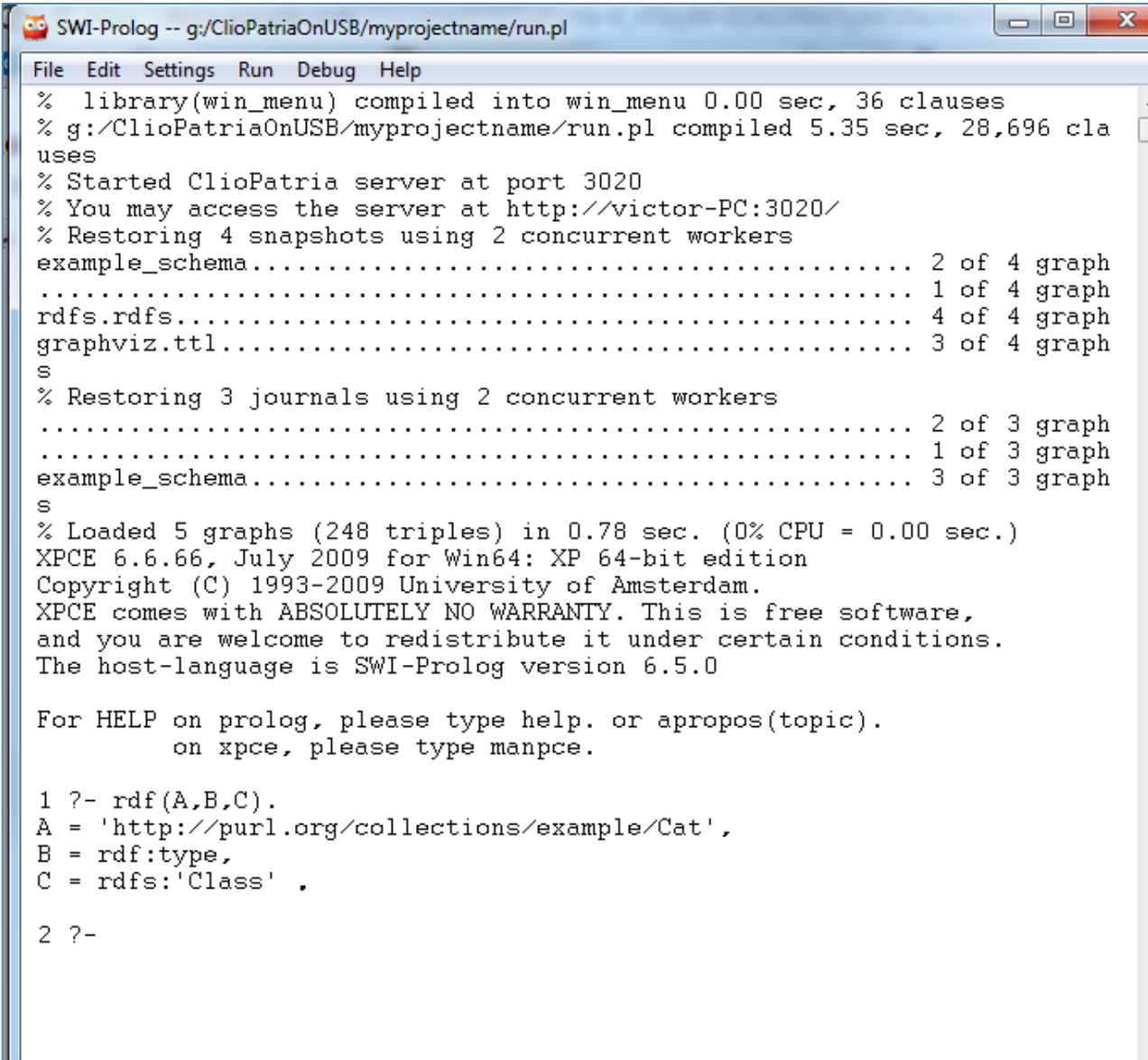
CPACKs

- Amalgame for vocabulary alignment
- XMLRDF for converting XML to RDF
- Prepackaged data and metadata sets
 - Provenance, SKOS, etc.
- UI packages
 - For specific web applications

ClioPatria model



RDF in SWI-Prolog



```
SWI-Prolog -- g:/ClioPatriaOnUSB/myprojectname/run.pl
File Edit Settings Run Debug Help
% library(win_menu) compiled into win_menu 0.00 sec, 36 clauses
% g:/ClioPatriaOnUSB/myprojectname/run.pl compiled 5.35 sec, 28,696 clauses
% Started ClioPatria server at port 3020
% You may access the server at http://victor-PC:3020/
% Restoring 4 snapshots using 2 concurrent workers
example_schema..... 2 of 4 graphs
..... 1 of 4 graphs
rdfs.rdfs..... 4 of 4 graphs
graphviz.ttl..... 3 of 4 graphs
% Restoring 3 journals using 2 concurrent workers
..... 2 of 3 graphs
..... 1 of 3 graphs
example_schema..... 3 of 3 graphs
% Loaded 5 graphs (248 triples) in 0.78 sec. (0% CPU = 0.00 sec.)
XPCe 6.6.66, July 2009 for Win64: XP 64-bit edition
Copyright (C) 1993-2009 University of Amsterdam.
XPCe comes with ABSOLUTELY NO WARRANTY. This is free software,
and you are welcome to redistribute it under certain conditions.
The host-language is SWI-Prolog version 6.5.0

For HELP on prolog, please type help. or apropos(topic).
on xpce, please type manxpce.

1 ?- rdf(A,B,C).
A = 'http://purl.org/collections/example/Cat',
B = rdf:type,
C = rdfs:'Class' .

2 ?-
```

RDF/3 predicate

```
6 ?- rdf(A,B,C).  
A = 'http://purl.org/collections/example/Cat',  
B = rdf:type,  
C = rdfs:'Class' .  
  
7 ?- rdf(A, 'http://purl.org/collections/example/likes', B).  
A = 'http://purl.org/collections/example/victor',  
B = 'http://purl.org/collections/example/truffel' .  
  
8 ?- rdf(A, B, literal(L)).  
A = 'http://purl.org/collections/example/Cat',  
B = rdfs:label,  
L = 'Cat' .  
  
9 ?- ■
```

More predicates

```
rdf_load(FileOrURI).
```

```
rdf_assert(Subject, Predicate, Object).
```

```
rdf_retractall(S,P,O).
```

ClioPatria UI

The screenshot shows a web browser window with the address bar containing `semanticweb.cs.vu.nl/radiomarche/home`. The browser's navigation bar includes back, forward, and refresh buttons. Below the address bar is a horizontal menu with tabs for [Places](#), [Admin](#), [Repository](#), [Query](#), [Help](#), and [Login](#). To the right of the menu is a search input field with a "Search" button. The main content area features a blue header with the text "Welcome to ClioPatria, the SWI-Prolog Semantic Web Server". Below this is a paragraph describing the server's capabilities. A section titled "About this server" follows, containing a paragraph and a bulleted list of features. Another section titled "Further information and contact" contains a bulleted list of links. The footer of the page displays the version information: "ClioPatria (version V3.0.0-32-g1e2f61d)".

← → ↻ semanticweb.cs.vu.nl/radiomarche/home 🔍 ☆ ☰

[Places](#) [Admin](#) [Repository](#) [Query](#) [Help](#) [Login](#)

Search

Welcome to ClioPatria, the SWI-Prolog Semantic Web Server

This server provides a Web frontend to the [SWI-Prolog SemWeb package](#) supporting both the [SPARQL](#) and [Sesame SeRQL](#) query language.

About this server

This server is built on top of the SWI-Prolog Web infrastructure ([PDF](#)). It provides a web front-end to the SWI-Prolog Semantic Web libraries ([PDF](#)). Features:

- Fast in-memory RDF triple store, **scalable** to approx. 15 million triples on 32-bit and virtually unlimited on 64-bit hardware.
- **Persistent** store using journal files
- Supports **SPARQL** and SeRQL 1.2 HTTP protocol for remote access
- **Full text search**: prefixes of literals, words appearing in literals, stemming

Further information and contact

- [SWI-Prolog site](#) and [manual](#)
- [SPARQL Documentation](#)
- [Sesame and SeRQL site](#)
- [ClioPatria mailinglist](#)
- [SWI-Prolog mailinglist](#)

ClioPatria (version V3.0.0-32-g1e2f61d) 🗨

Statistics: Named Graphs

← → ↻ semanticweb.cs.vu.nl/radiomarche/browse/list_graphs

Places Admin Repository Query Help Login

Home

Graphs

Prefixes

1 graphs in the RDF store

RDF Graph	Triples
http://purl.org/collections/w4ra/radiomarche/market_data.ttl	1,952
http://www.w3.org/2004/02/skos/core	256
http://www.w3.org/2000/01/rdf-schema	190
http://www.w3.org/2002/07/owl	163
http://purl.org/collections/w4ra/radiomarche/rm-schema.ttl	112
http://purl.org/collections/w4ra/radiomarche/rm_dutch_labels.ttl	77
http://dbpedia.org/resource/Mafoune	63
http://dbpedia.org/resource/Mandiakuy	61
http://dbpedia.org/resource/Lanfiala	56
http://sws.geonames.org/2453944/about.rdf	
http://sws.geonames.org/2454544/	
http://purl.org/collections/w4ra/radiomarche/	
http://purl.org/collections/w4ra/radiomarche/	

Summary information for graph

"http://purl.org/collections/w4ra/radiomarche/market_data.ttl"

Source URL:	file:///home/ecdemo/src/radiomarche/Radiomarche/rdf/market_data.ttl
# predicates:	27
# subjects:	214
# bnode subjects:	0
# Referenced classes:	10

- Show this graph as
- Download this graph as
- Compute a schema for this graph and the result as

Statistics: predicates in a Named Graph

← → ↻ semanticweb.cs.vu.nl/radiomarche/browse/list_predicates?graph=http://purl.org/collections/w4ra/radiomarche/ 🔍 ☆ ☰

Places Admin Repository Query Help Login

Search

Predicates in graph http://purl.org/collections/w4ra/radiomarche/market_data.ttl

Predicate	#Triples	#Distinct subjects	#Distinct objects	Domain(s)	Range(s)
com_id	23	23	23	Communique	rdfs:Literal
com_number	90	90	18	Offering	rdfs:Literal
con_com_id	52	23	17	Communique	rdfs:Literal
contact_address	13	13	""	Offering	rdfs:Literal
contact_fname	21	19	20	2	rdfs:Literal
contact_lname	19	19	13	2	rdfs:Literal
contact_tel	24	18	22	Person	rdfs:Literal
currency	90	90	2	Offering	Currency
has_communique	90	90	23	Offering	Communique
has_contact	89	89	18	Offering	Person
has_offering	90	23	90	Communique	Offering
in_zone	26	19	6	Village	Zone
rdfs:label	90	83	84	7	rdfs:Literal
price	90	90	16	Offering	Price
prod_com_id	90	90	6	Offering	rdfs:Literal
prod_name	90	90	5	Offering	Product
quality	90	90	19	Offering	rdfs:Literal
quantity	90	90	33	Offering	Quantity
store_id	90	90	90	Offering	rdfs:Literal
ts_date_delivered	90	90	24	Offering	rdfs:Literal
ts_date_entered	90	90	68	Offering	rdfs:Literal
rdf:type	214	214	10	10	rdfs:Resource
unit_measure	90	90	2	Offering	Measure
user_id	90	90	3	Offering	rdfs:Literal
village	23	19	19	2	Village
ns1:voicelabel_en	77	76	71	6	rdfs:Resource
zone	21	19	6	2	Zone

ClioPatria (version V3.0.0-32-g1e2fb1d)

Local view of a resource

Local view for "http://purl.org/collections/w4ra/radiomarche/product-Beurre_de_karite"

Predicate	Value (sorted: default)
rdfs:label	"Beurre de karite" ²
rdf:type	Product ²
skos:has_exact_match	http://aims.fao.org/aos/agrovoc/c_37951 ¹ http://dbpedia.org/resource/Shea_butter ¹
ns1:voicelabel_en	http://semanticweb.cs.vu.nl/amalgame/voicetest/VXMLtest/audio/Beurre_de_karite_en.wav ²
ns1:voicelabel_nl	http://semanticweb.cs.vu.nl/amalgame/voicetest/VXMLtest/audio/Beurre_de_karite_nl.wav ³

Named graphs describing this resource:

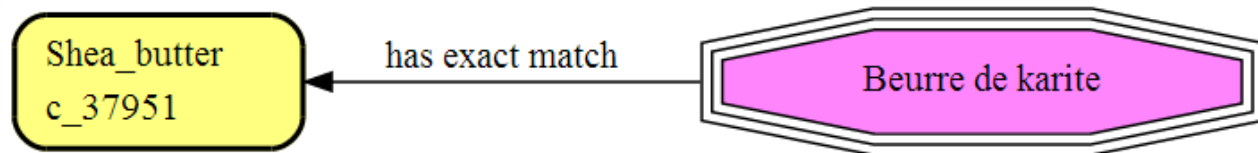
¹<http://purl.org/collections/w4ra/radiomarche/alignments.ttl>

²http://purl.org/collections/w4ra/radiomarche/market_data.ttl

³http://purl.org/collections/w4ra/radiomarche/rm_dutch_labels.ttl

The resource appears as object in [37 triples](#)

Context graph



Get external RDF data from the Linked Data Cloud

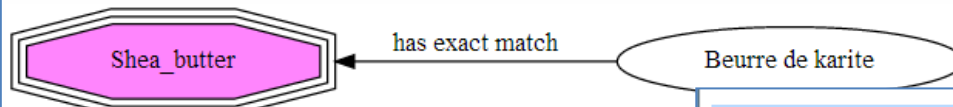
Local view for "http://dbpedia.org/resource/Shea_butter"

No triples for [this URI](#). Would you like to ?

The resource appears as object in one triple:

```
{ Beurre de karite, skos:exactMatch,
  <http://dbpedia.org/resource/Shea_butter> }
```

Context graph



Local view for "http://dbpedia.org/resource/Shea_butter"

Predicate	Value (sorted: default)
rdfs:label	"Shea butter"@en < http://dbpedia.org/class/yago/CookingFats >
rdfs:type	< http://dbpedia.org/class/yago/CropsOriginatingFromAfrica > < http://dbpedia.org/class/yago/VegetableOils > "Shea butter is a slightly yellowish or ivory-colored fat extracted from the fruit of the African shea tree (Vitellaria paradoxa). It is widely used in cosmetic preparation. Occasionally the chocolate industry uses shea butter oils, as a substitute for cocoa butter, although the taste is different. "shea" comes from s'i, the tree's name in the Bamana language of Mali." <i>"Karitevoi, tai myös Sheavoi on kasvirasva, jota saadaan karitepuun (Vitellaria paradoxa) pähkinästä. Sitä käytetään laajasti kosmetiikan raaka-aineena." "Le beurre de karité, ou beurre végétal, est une substance comestible extraite des fruits du karité, un arbre poussant dans les savanes arborées de l'Afrique de l'ouest et dont le nom signifie « vie » en langue mandingue. Le beurre de karité est consommé dans la cuisine traditionnelle ou utilisé dans l'industrie cosmétique substitué au beurre de cacao. Il est surtout connu pour ses propriétés hydratantes et assouplissantes de la peau."@fr</i> <i>"参照のこと"]シアバター（英: shea butter）はアカテツ科のシロアリの胚から得られる植物性脂肪。シアバターとも表記される。"시어버터는 강력한 항염효과를 지닌 식물성 오일이다. 학명 Butyrospermum parkii (부티로스퍼멈 파키)이다. 시어버터는 고온에서 지방산 추출물로 가공되지 않은 상태의 시어버터는 25%~30%가 항산화 (Phenolics) 성분으로 구성되어 있고, 국</i>
rdfs:comment	

← → ↻ semanticweb.cs.vu.nl/radiomarche/flint/index.html 🔍 ☆













Places Admin Repository **Query** Help Login

SPARQL Editor Search

Simple Form

Flint SPARQL Editor 1.0.3

New Edit View Help

Dataset Mode Output

Query 1 ✖

```
1 PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
2 PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
3
4 SELECT * WHERE {
5     ?s ?p ?o
6 }
7 LIMIT 10
```

Line: 1; Position: 1; Query is valid

Query Results

So let's get our RDF in a triple store!