

# Databázové systémy

Dáta v grafe – dátá na webe

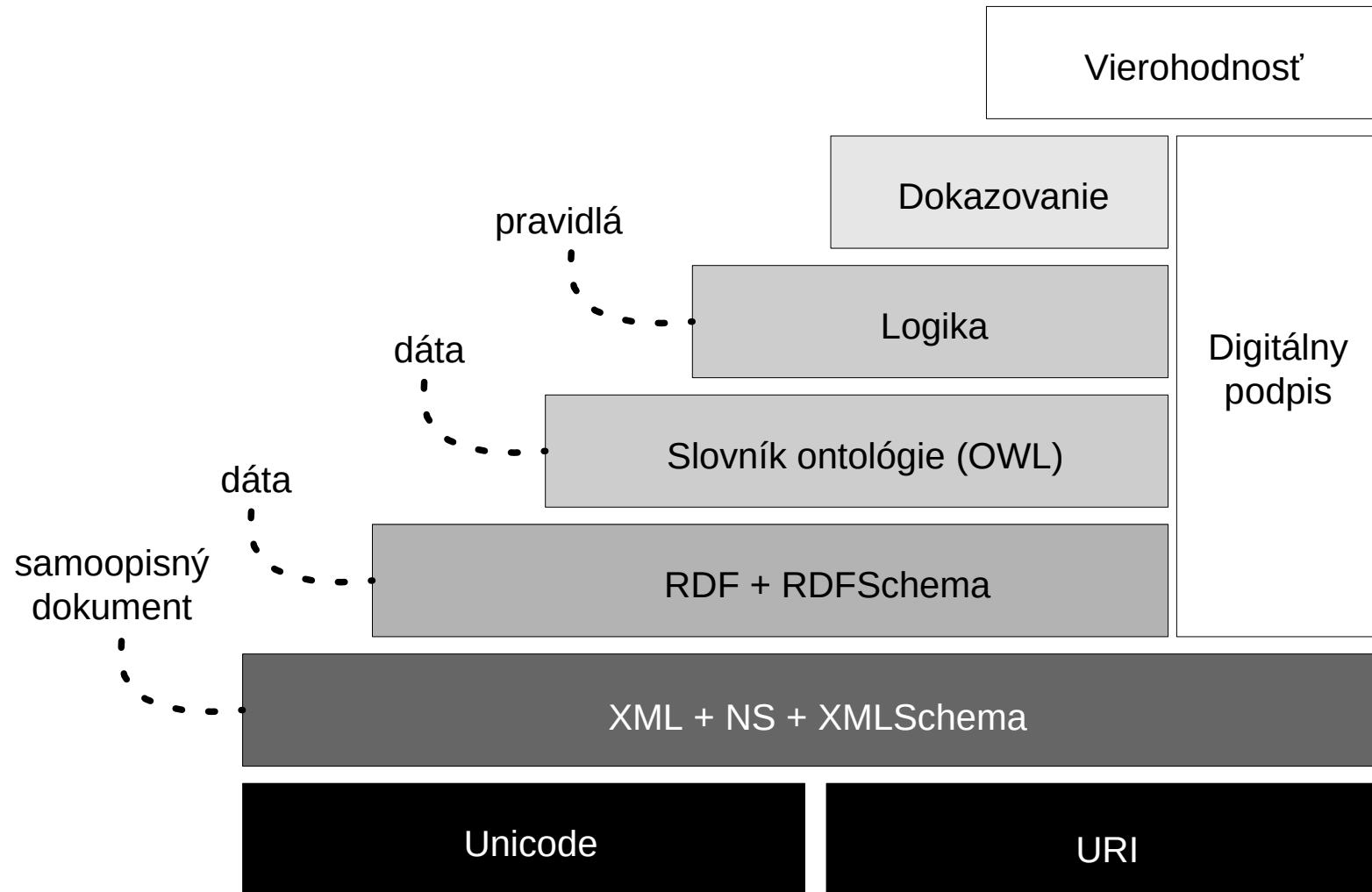
# Vyhľadávanie na webe

- Chceme nájsť informáciu, ale hádame kľúčové slová, ktoré sa snáď vyskytujú na stránke s informáciou
- Väčšinou dostaneme milióny výsledkov
  - Drvivá väčšina z nich je zbytočná
- Ak je naše kľúčové slovo homonymom pre niečo frekventované, budeme často neúspešní
  - Monitor – LCD/CRT
  - Monitor – sledovanie

# Čo potrebujeme?

- Zadať vyhľadávaču to, čo chceme vedieť,
  - nie kľúčové slová
- Web je sietou dokumentov určených pre ľudí
  - HTML a jeho značky definujú vizualizáciu
- Mat' web ako siet informácií, ktorým rozumie človek a ktoré zároveň dokáže spracovať stroj
  - Web so sémantikou

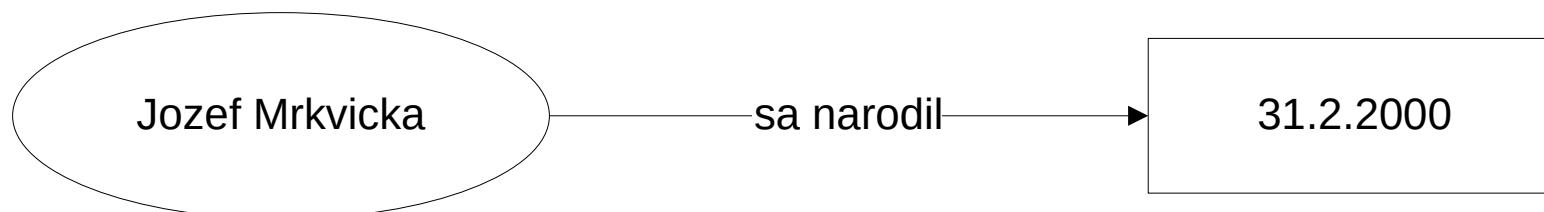
# Vrstvy webu so sémantikou



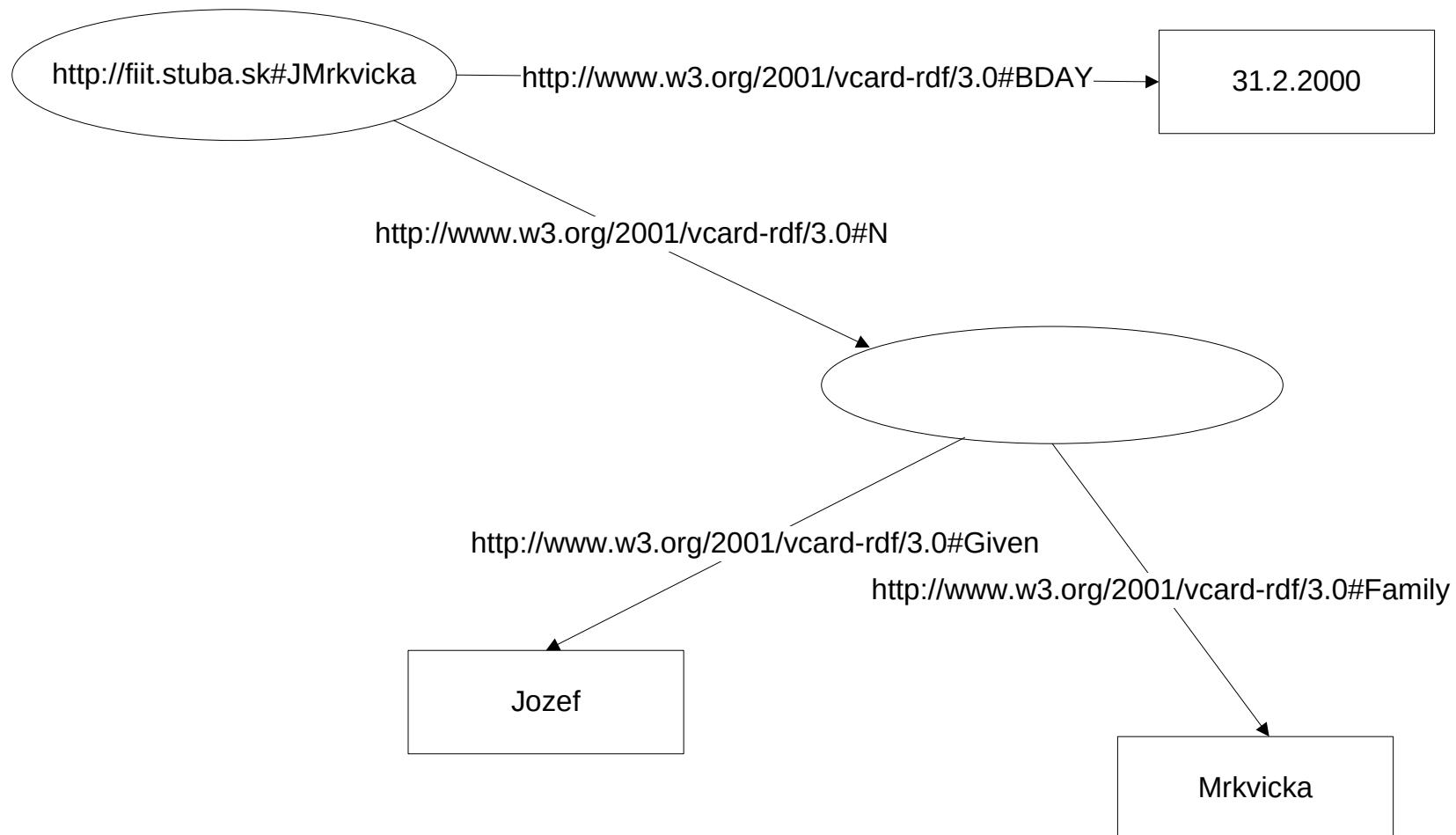
# Resource Description Framework

## RDF

- Zápis tvrdení o zdrojoch pomocou trojíc
  - subjekt – predikát – objekt
- Príklad
  - Subjekt: Jozef Mrkvička
  - Predikát: sa narodil
  - Objekt: 31.2.2000



# Príklad zápisu v RDF



# Odvodzovanie

## Príklad:

+ Peter má mamu Evu

X mama Y ak  
X rodič Y  
žena X

+ Jozef má mamu Evu

X súrodenec Y ak  
Z rodič X  
Z rodič Y

+ Jozef má syna Ferka

X stará mama Y ak

Môžem sa pýtať aj na to,  
čo som systému explicitne nepovedal!!

Peter je Ferkov strýko



Eva je Ferkova stará mama

X je strýko Y ak  
Y syn Z  
X súrodenec Z

# SPARQL

- Dopytovací jazyk pre semantický web
  - Pre dátá uložené v RDF
- Dopyt do viacerých datasetov v jednom dopyte
- Pekný tutoriál
  - <http://www.cambridgesemantics.com/semantic-university/sparql-by-example>

# SPARQL

PREFIX foaf: <<http://xmlns.com/foaf/0.1/>>

SELECT ?name ?email

WHERE {

?person a foaf:Person.

?person foaf:name ?name.

?person foaf:mbox ?email.

}

# Napr. DBpedia

```
SELECT ?vztah, ?objekt  
WHERE {  
{ <http://dbpedia.org/resource/Slovakia> ?vztah  
?objekt }  
}
```

- <http://dbpedia.org/sparql>

# Iný príklad z DBPedie

PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>

PREFIX type: <http://dbpedia.org/class/yago/>

PREFIX prop: <http://dbpedia.org/property/>

SELECT ?country\_name ?population

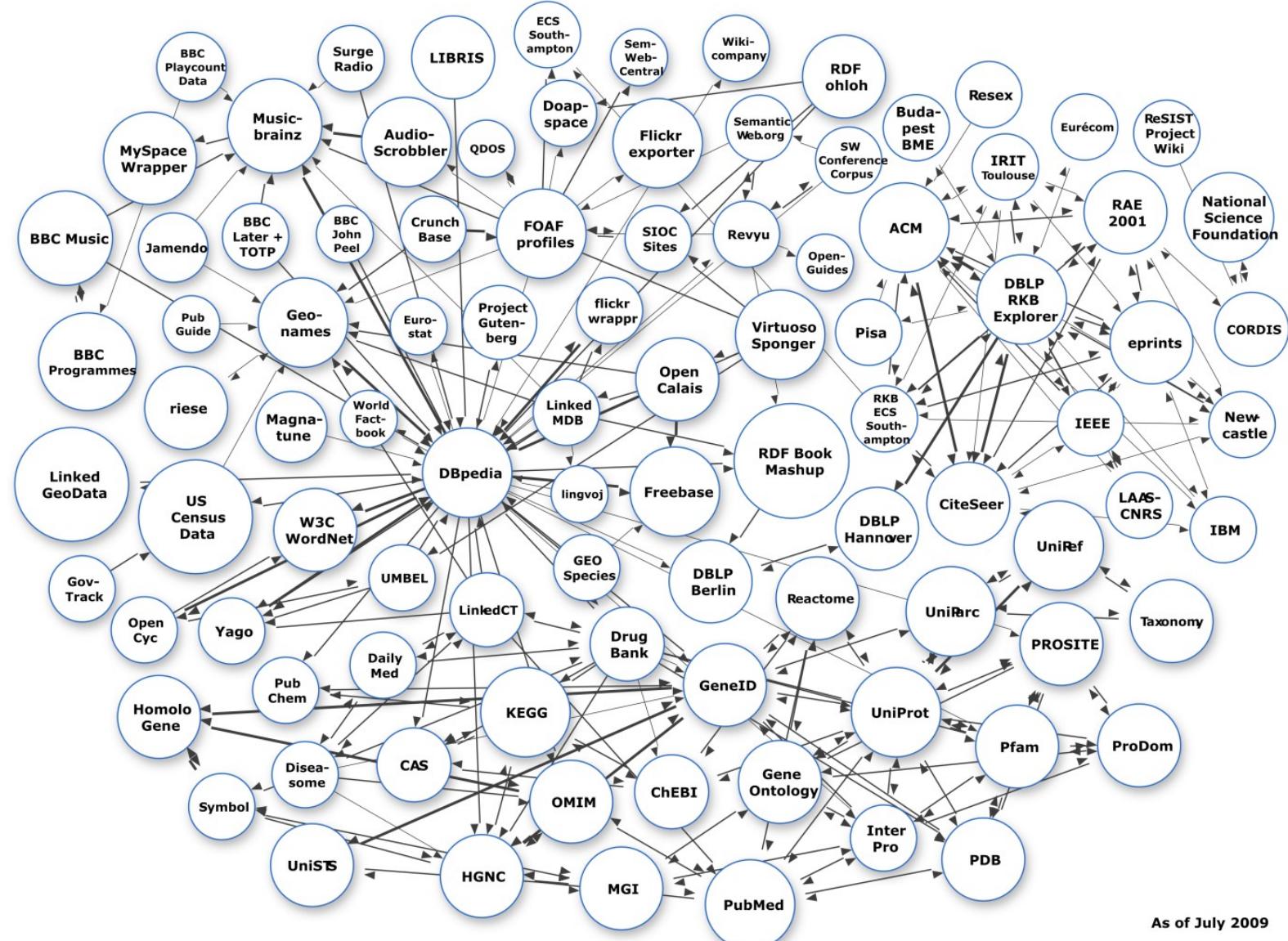
WHERE {

    ?country a type:LandlockedCountries ;  
        rdfs:label ?country\_name ;  
        prop:populationEstimate ?population .

    FILTER (?population > 15000000) .

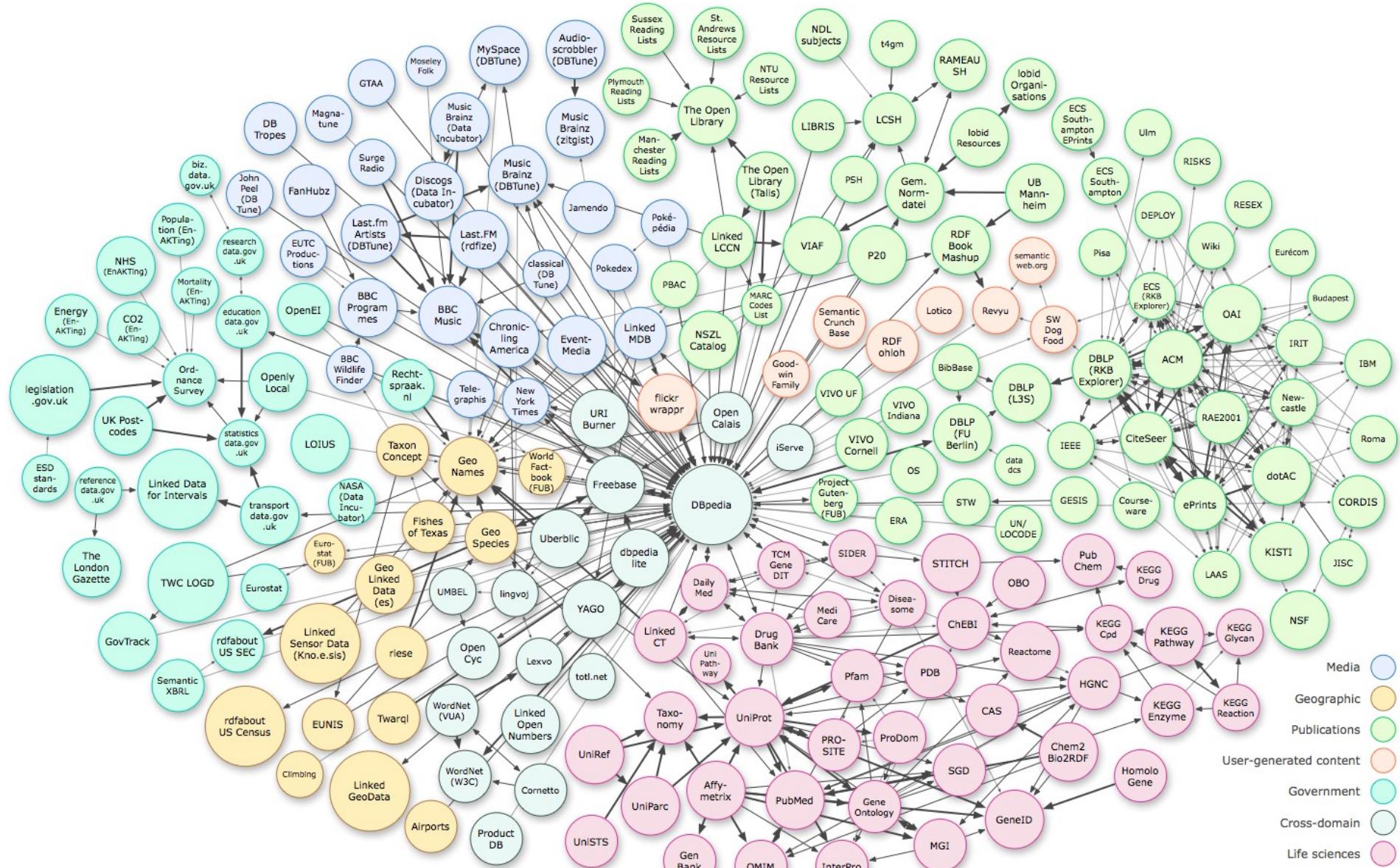
}

# V praxi...

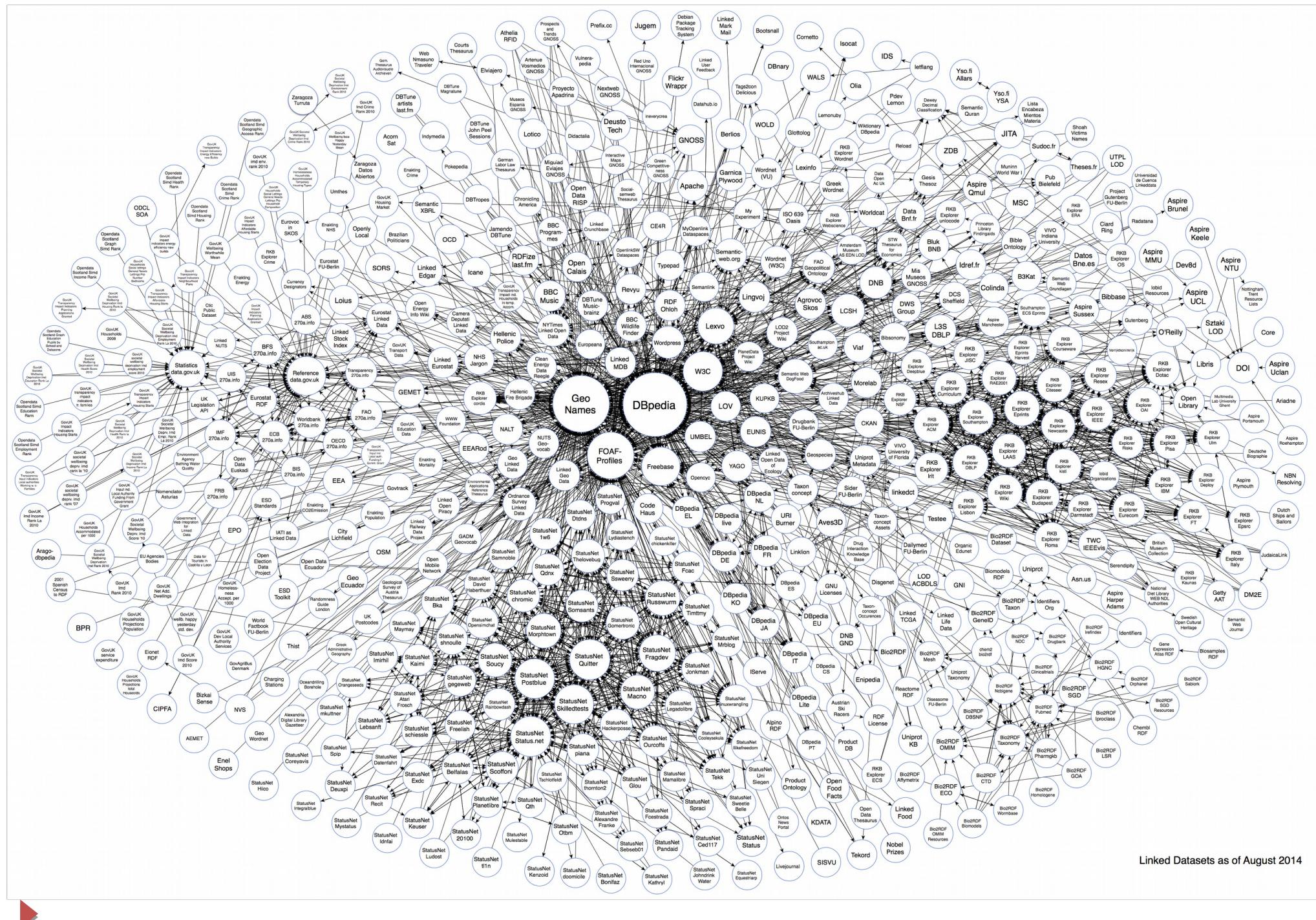


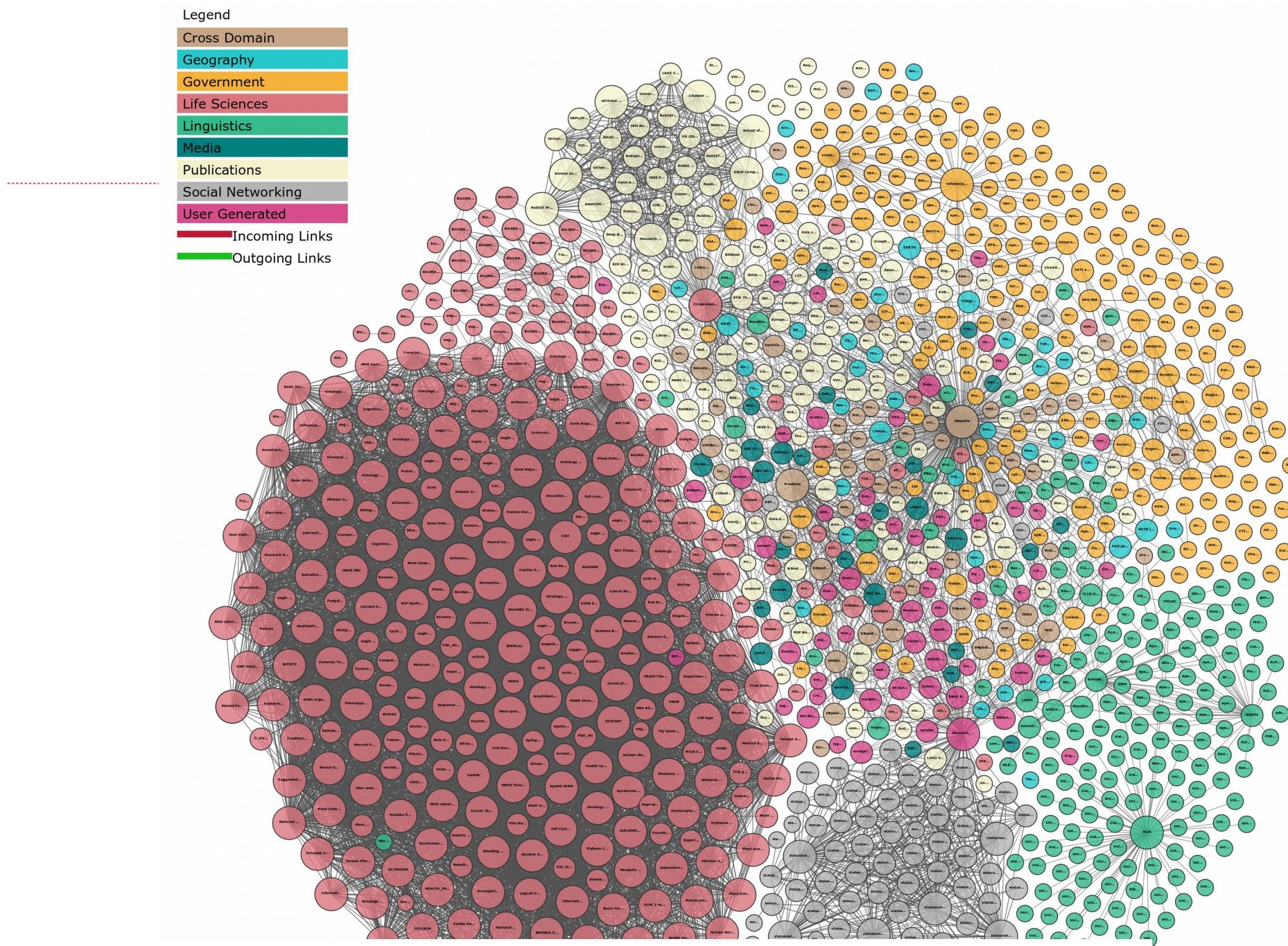
As of July 2009

# LinkedData



As of September 2010





Linking Open Data cloud diagram 2017, by Andrejs Abele, John P. McCrae, Paul Buitelaar, Anja Jentzsch and Richard Cyganiak.  
<http://lod-cloud.net/>

# Ešte viac v praxi?

Google tim berners-lee

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**Tim Berners-Lee - Wikipedia, the free encyclopedia**  
[en.wikipedia.org/wiki/Tim\\_Berners-Lee](https://en.wikipedia.org/wiki/Tim_Berners-Lee) ▾  
Tim Berners-Lee at the Home Office, London, on 11 March 2010. In June 2009 then British Prime Minister Gordon Brown announced Berners-Lee would work ...  
[Conway Berners-Lee](#) - Enquire - Ferranti Mark 1 - Mary Lee Woods

**Tim Berners-Lee - World Wide Web Consortium**  
[www.w3.org/People/Berners-Lee/](https://www.w3.org/People/Berners-Lee/) ▾  
A graduate of Oxford University, Tim Berners-Lee invented the World Wide Web, an internet-based hypermedia initiative for global information sharing while at ...

**Longer Bio for Tim Berners-Lee - World Wide Web Consortium**  
[www.w3.org/People/Berners-Lee/Longer.html](https://www.w3.org/People/Berners-Lee/Longer.html) ▾  
Tim Berners-Lee graduated from the Queen's College at Oxford University, England, 1976. Whilst there he built his first computer with a soldering iron, TTL gates ...

**Tim Berners-Lee (timberners\_lee) on Twitter**  
[https://twitter.com/timberners\\_lee](https://twitter.com/timberners_lee) ▾  
The latest from Tim Berners-Lee (@timberners\_lee). Director of the World Wide Web Consortium (W3C) w3.org, the place to agree on web standards. Founded ...

**Tim Berners-Lee: The next web | Talk Video | TED - TED.com**



More images

## Tim Berners-Lee

Computer Scientist

Sir Timothy John "Tim" Berners-Lee, OM, KBE, FRS, FREng, FRSA, DFBCS, also known as "TimBL", is a British computer scientist, best known as the inventor of the World Wide Web. [Wikipedia](#)

**Born:** June 8, 1955 (age 58), [London, United Kingdom](#)

**Nationality:** British

**Books:** [Weaving the Web: The Original Design and Ultimate Destiny of the World Wide Web by its Inventor](#)

**Parents:** [Mary Lee Woods](#), [Conway Berners-Lee](#)

**Awards:** MacArthur Fellowship, Marconi Prize, Charles Stark Draper Prize, Mountbatten Medal, President's Medal

**Education:** [The Queen's College, Oxford](#) (1973–1976), [Emanuel School](#)

The Knowledge Graph

Learn more about one of the key breakthroughs behind the future of search.

Leonardo da Vinci

Ginevra de' Benci  
1478

The Virgin of the Rocks  
a...  
1508

Adoration of the Magi  
1481

Feedback

Born: April 15, 1452, Anchiano  
Died: May 2, 1519, Clos Lucé  
Buried: Château d'Amboise  
Parents: Caterina da Vinci, Piero da Vinci  
Structures: Veljimir Sand Da Vinci Project

See it in action

Discover answers to questions you never thought to ask, and explore collections and lists.

[Get Started](#)[Introduction](#)[Prerequisites](#)[How To...](#)[Install Client Libraries](#)[Authorize Requests](#)[Use the Knowledge Graph Search Widget](#)[Terms of Service](#)

# Google Knowledge Graph Search API



The Knowledge Graph Search API lets you find entities in the [Google Knowledge Graph](#). The API uses standard [schema.org](#) types and is compliant with the [JSON-LD](#) specification.

## Typical use cases

Some examples of how you can use the Knowledge Graph Search API include:

- Getting a ranked list of the most notable entities that match certain criteria.
- Predictively completing entities in a search box.
- Annotating/organizing content using the Knowledge Graph entities.



**Note:** The Knowledge Graph Search API is a read-only API.

For detailed information about the API methods and parameters, see the [API Reference](#).

## Sample request

The following example shows one kind of request you can send to the API. (But check the [Prerequisites](#) section first. You'll also need to insert your own API key.)

```
https://kgsearch.googleapis.com/v1/entities:search?query=taylor+swift&key=[API_KEY]&limit=1&indent=True
```



# Web dát

## [Black Books \(TV Series 2000–2004\) - IMDb](#)

[www.imdb.com/title/tt0262150/](http://www.imdb.com/title/tt0262150/) ▾

★★★★★ Rating: 8.7/10 - 27,671 votes

Bernard **Black** runs his own bookshop even though he doesn't much like people who buy **books** and hates having customers. Next door to Bernard's shop is the ...

[Episodes](#) - [Full Cast & Crew](#) - [Trivia](#) - [Awards](#)

## [Pifco P28021 Robotic Vacuum Cleaner, 25 W - Red: Amazon.co.uk ...](#)

<https://www.amazon.co.uk/Pifco-P28021-Robotic-Vacuum-Cleaner/dp/B00PZW36PO> ▾

★★★☆☆ Rating: 2.4 - 19 reviews

Free delivery and returns on eligible orders. Buy Pifco P28021 Robotic Vacuum Cleaner, 25 W - Red at Amazon UK.

A screenshot of an email application interface. At the top is a search bar with a magnifying glass icon. Below it is a toolbar with several icons: back, forward, download, trash, and others. To the right of the toolbar are buttons for "Move to Inbox", "More", and a dropdown menu.

Your Boarding Pass Confirmation [Inbox](#) x

A screenshot of an email message titled "Your Boarding Pass Confirmation". The message content includes a flight summary for Luxair Flight 8852 from Vienna VIE to Luxembourg City LUX, departing at 9:40 AM and arriving at 11:25 AM. The message is displayed in a clean, modern interface with a grey header and white body.

# Web dát

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- Microdata embedované vo vašej stránke
- slovník zo schema.org (spolupráca Google, Bing, Yahoo, Yandex)
- Open Graph Protocol od Facebooku
- Twitter card data

# Microdata + schema.org slovník

---

```
<div itemscope itemtype = "http://schema.org/Movie">
  <h1 itemprop="name">Avatar</h1>
  <div itemprop="director" itemscope
itemtype="http://schema.org/Person">
    Director: <span itemprop="name">James Cameron</span>
    (born <span itemprop="birthDate">August 16, 1954</span>
    </div>
    <span itemprop="genre">Science fiction</span>
    <a href=".../movies/avatar-theatrical-trailer.html"
      itemprop="trailer">Trailer</a>
  </div>
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    itemprop="trailer">Trailer</a>
  </div>
```

# JSON-LD príklad

---

```
<script type="application/ld+json">
{
  "@context": "http://schema.org",
  "@type": "Organization",
  "url": "http://www.example.com",
  "name": "Unlimited Ball Bearings Corp.",
  "contactPoint": {
    "@type": "ContactPoint",
    "telephone": "+1-401-555-1212",
    "contactType": "Customer service"
  }
}</script>
```



# Čo všetko sa takto dá uverejniť

---

- ▶ Product
- ▶ Place
- ▶ Person
- ▶ Organization
- ▶ MedicalEntity
- ▶ Intangible (nehmotné – napr. ponuka, objednávka, služba, hodnotenie...)
- ▶ Event
- ▶ CreativeWork (článok, film, fotka, hudba, ...)
- ▶ Akcia

# Zhrnutie

- Vyššia vrstva abstrakcie nad dátami
  - Zdielané slovníky, odvodzovanie
- Graf ako základná štruktúra webu so sémantikou (LinkedData)
  - RDF, RDFS(S), OWL
- SPARQL a SPARQL endpoints
- Microdata