



Università degli Studi di Roma “Tor Vergata”

Gestione di dati RDF con Ontotext GraphDB *...ed un pizzico di LOV*

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Ontotext GraphDB

Ontotext GraphDB è una *famiglia di repository semantici* affidabili, scalabili e ricchi di funzionalità.

- **GraphDB Free**: gratuito da usare, ma limitato a 2 query concorrenti
- **GraphDB SE**: nessun limite al numero di query concorrenti
- **GraphDB EE**: modalità cluster per garantire alta disponibilità (availability), resilienza (resilience) and throughput

Possibilità di deployment con Docker o Puppet.

È anche disponibile come soluzione cloud managed (parte della Ontotext Cognitive Cloud)

GraphDB Free

GraphDB Free può essere **usato gratuitamente**, ma è necessario registrarsi sul sito di Ontotext:

Il link per il download viene fornito in una email spedita all'indirizzo indicato nel form di registrazione

È equivalente a **GraphDB SE**, fatta eccezione per il fatto di essere limitato a due query concorrenti.

È implementato come un Sail RDF4J (ulteriori informazioni nelle prossime lezioni)

GraphDB Free – standalone server

Noi useremo lo **standalone server**:

- È una *distribuzione autosufficiente*: nel richiede un servlet container esterno (es. Apache Tomcat); tuttavia, necessita che nel sistema sia installato Java 8+
- Può essere lanciato eseguendo un solo script (`graphdb[.cmd]`)
- Il *workbench grafico* è raggiungibile all'indirizzo
<http://localhost:7200>

GraphDB Free – Funzionalità (1/4)

- Usabile gratuitamente;
- Gestisce decine di miliardi di statement RDF su un singolo server;
- Esegue operazioni di query e ragionamento usando indici basati su file;
- Pieno supporto a SPARQL 1.1;
- Deployment e portabilità semplificate dall'uso di JAVA;
- Scalabilità, sia in termini di volume dei dati sia di velocità di caricamento e inferenza;
- Compatibile con RDF4J 2.0;
- Compatibile con Jena attraverso un adattatore incluso;

Fonte: <http://graphdb.ontotext.com/documentation/free/free/graphdb-free.html>

GraphDB Free – Funzionalità (2/4)

- Ragionamento pienamente compatibile con gli standard per RDFS, OWL 2 RL e QL;
- Supporto per regole personalizzate; regole ottimizzate per le prestazioni;
- Supporto ottimizzato per l'integrazione dei dati attraverso owl:sameAs;
- Indici speciali per vincoli geo-spatiali efficienti (near-by, within, distance);
- Ricerca full-text, basata su Lucene;

Source: <http://graphdb.ontotext.com/documentation/free/free/graphdb-free.html>

GraphDB Free – Funzionalità (3/4)

- Ritrazione efficiente di statement inferita dopo aggiornamenti;
- Affidabile nel preservare i dati, la loro consistenza ed integrità;
- Import/export di sintassi RDF attraverso RDF4J: XML, N3, N-Triples, N-Quads, Turtle, TriG, TriX;
- API plugin framework, public classes and interfaces;
- Ottimizzatore di query che permette di valutare diverse piani di interrogazione;

Source: <http://graphdb.ontotext.com/documentation/free/free/graphdb-free.html>

GraphDB Free – Funzionalità (4/4)

- RDF rank per ordinare i risultati delle query per rilevanza o altre misure;
- Notifiche permettono ai client di reagire a statement nel flusso degli aggiornamenti;
- Connettore Lucene per ricerche normali e faceted (aggregazione) estremamente veloci; automaticamente aggiornato con i dati in GraphDB;
- GraphDB Workbench - lo strumento predefinito di amministrazione basato sul web;
- LoadRDF per creare repository molto velocemente da dataset grandi;

Source: <http://graphdb.ontotext.com/documentation/free/free/graphdb-free.html>

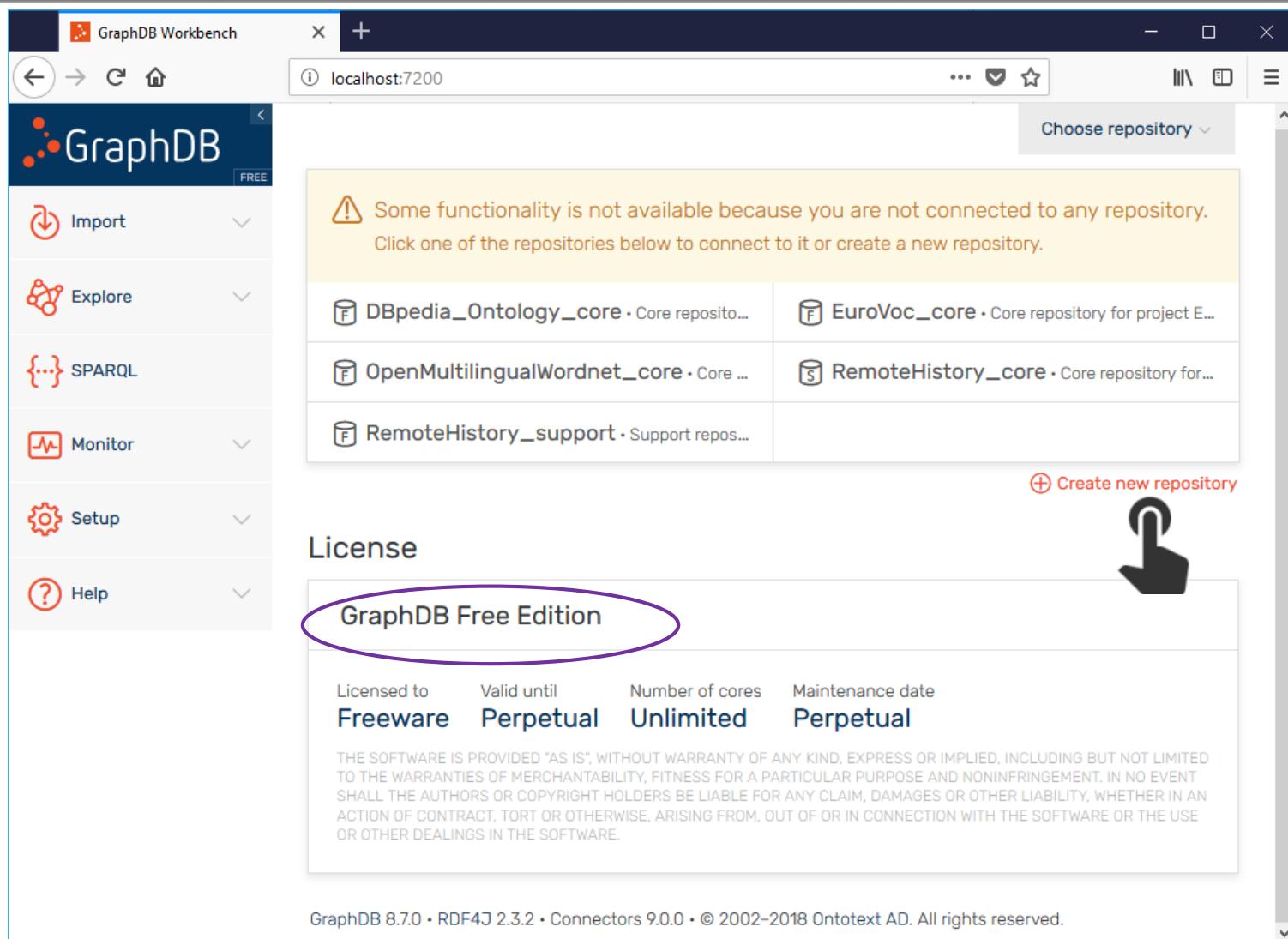
Avviare GraphDB

Avviare il Worbench di GraphDB è davvero semplice:

- Scompattare l'archivio relativo alla distruzione standalone
- Avviare lo script *bin/graphdb* (Linux) o *bin/graphdb.cmd* (Windows)
- Puntare il browser web all'indirizzo <http://localhost:7200>

Per impostazione predefinita, **GraphDB parte in maniera non sicura**; tuttavia, esso supporta **l'autenticazione** degli utenti, **controllo di accesso** basato su ruoli e l'uso della **crittografia in transito**. Inoltre, possibilità di specificare **timeout e limit sui risultati delle query**.

Workbench a colpo d'occhio



The screenshot shows the GraphDB Workbench interface running in a browser window. The left sidebar contains links for Import, Explore, SPARQL, Monitor, Setup, and Help, with a 'FREE' badge next to the title. The main area displays a warning message: "Some functionality is not available because you are not connected to any repository. Click one of the repositories below to connect to it or create a new repository." Below this are three repository entries: DBpedia_Ontology_core, EuroVoc_core, and RemoteHistory_core. A red callout points to the "Create new repository" button at the bottom right of this section. The "License" section is shown below, featuring a purple oval around the "GraphDB Free Edition" text. The license details are: Licensed to Freeware, Valid until Perpetual, Number of cores Unlimited, and Maintenance date Perpetual. A large black hand icon is overlaid on the "Create new repository" button. At the bottom, a footer note states: "THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE."

GraphDB Workbench

localhost:7200

Choose repository

Import

Explore

SPARQL

Monitor

Setup

Help

FREE

⚠ Some functionality is not available because you are not connected to any repository.
Click one of the repositories below to connect to it or create a new repository.

DBpedia_Ontology_core • Core repository

EuroVoc_core • Core repository for project E...

OpenMultilingualWordnet_core • Core ...

RemoteHistory_core • Core repository for...

RemoteHistory_support • Support repos...

+ Create new repository

License

GraphDB Free Edition

Licensed to Freeware

Valid until Perpetual

Number of cores Unlimited

Maintenance date Perpetual

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GraphDB 8.7.0 • RDF4J 2.3.2 • Connectors 9.0.0 • © 2002–2018 Ontotext AD. All rights reserved.

Creazione di un repository (1/3)

La creazione di un nuovo repository è il **primo passo** indispensabile per usare GraphDB.

- Un repository è il *luogo in cui possiamo caricare le triple RDF e la maggior parte delle operazioni sono eseguite su un certo repository.*
- Quando creiamo un repository, possiamo specificare diversi *parametri di configurazione* (alcuni dei quali possono essere cambiati in seguito):

<http://graphdb.ontotext.com/documentation/free/configuring-a-repository.html#configuring-a-repository-configuration-parameters>

GraphDB può gestire più repository.

Creazione di un repository (2/3)

Indici subject-predicate (SP) e object-predicate (OP) (per query con predicato non istanziato, se ci sono tanti predicati)

Indice CPSO

Rollback di una transazione che introduce una inconsistenza

Set di regole

Ottimizzazione per owl:sameAs

Capacità iniziale della tabella di hash da termini RDF a interi che li identificano internamente

Caching delle caratteristiche dei literal

Permette l'uso di un apposito indice, trovate literal che soddisfano vincoli di (dis)uguaglianza

Repository properties

Repository ID*: **Test**

Repository title:

Type: GRAPHDB-FREE

Storage folder: storage

Ruleset: RDFS-Plus (Optimized)

Disable owl:sameAs

Base URL: http://example.org/owlim#

Entity index size: 10000000

Use predicate indices

Use context index

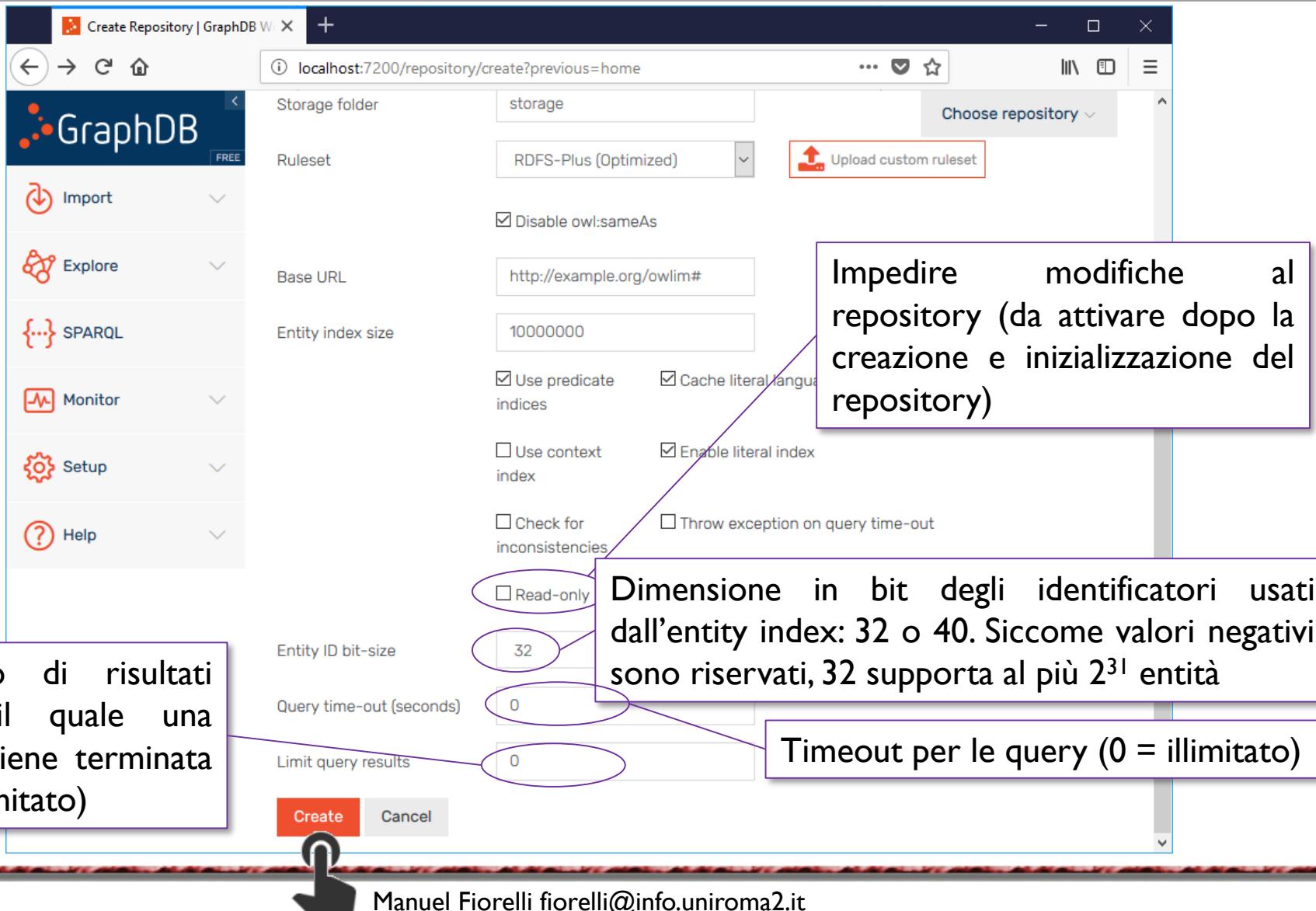
Cache literal language tags

Enable literal index

Throw exception on query time-out

Check for inconsistencies

Creazione di un repository (3/3)



The screenshot shows the 'Create Repository' interface for GraphDB. On the left is a sidebar with links: Import, Explore, SPARQL, Monitor, Setup, and Help. The main area has the following fields:

- Storage folder:** storage
- Ruleset:** RDFS-Plus (Optimized)
- Base URL:** http://example.org/owlim#
- Entity index size:** 10000000
- Entity ID bit-size:** 32
- Query time-out (seconds):** 0
- Limit query results:** 0
- Checkboxes and Options:**
 - Disable owl:sameAs
 - Use predicate indices
 - Use context index
 - Cache literal language
 - Enable literal index
 - Throw exception on query time-out
 - Read-only

Annotations with arrows point to specific fields:

- An annotation points to the 'Entity index size' field with the text: "Dimensione in bit degli identificatori usati dall'entity index: 32 o 40. Siccome valori negativi sono riservati, 32 supporta al più 2^{31} entità".
- An annotation points to the 'Entity ID bit-size' field with the value '32'.
- An annotation points to the 'Entity ID bit-size' field with the value '0'.
- An annotation points to the 'Limit query results' field with the value '0'.
- An annotation points to the 'Query time-out (seconds)' field with the value '0'.
- An annotation points to the 'Cache literal language' checkbox with the text: "Impedire modifiche al repository (da attivare dopo la creazione e inizializzazione del repository)".
- An annotation points to the 'Cache literal language' checkbox with the text: "Timeout per le query (0 = illimitato)".

At the bottom left, there is a large hand cursor icon pointing towards the 'Create' button. The 'Create' and 'Cancel' buttons are at the bottom right.

Numero di risultati dopo il quale una query viene terminata (0 = illimitato)

Selezione di un repository (1/2)

The screenshot shows the GraphDB Workbench interface running in a browser window. The title bar says "GraphDB Workbench". The address bar shows "localhost:7200". A sidebar on the left lists "Import", "Explore", "SPARQL", "Monitor", "Setup", and "Help". The main area has a yellow warning box stating: "Some functionality is not available because you are not connected to any repository. Click one of the repositories below to connect to it or create a new repository." Below this are several repository options: "DBpedia_Ontology_core · Core reposi...", "EuroVoc_core · Core repository for project ...", "OpenMultilingualWordnet_core · Cor...", "RemoteHistory_core · Core repository f...", "RemoteHistory_support · Support rep...", and "Test". A large hand cursor icon is pointing at the "Test" repository. A red button labeled "+ Create new repository" is visible. Below the repository list is a section titled "License" with "GraphDB Free Edition" details: "Licensed to Freeware", "Valid until Perpetual", "Number of cores Unlimited", and "Maintenance date Perpetual". A note at the bottom states: "THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE." At the bottom of the page, the footer reads: "GraphDB 8.7.0 · RDF4J 2.3.2 · Connectors 9.0.0 · © 2002–2018 Ontotext AD. All rights reserved."

Selezione di un repository (2/2)

The screenshot shows the GraphDB Workbench interface running in a browser window at localhost:7200. The left sidebar contains links for Import, Explore, SPARQL, Monitor, Setup, and Help. The main area is titled 'View resource' and shows a 'Search RDF resource' input field. A modal dialog is open over the interface, listing 'Active repositories'. The 'Test' repository is selected, highlighted with a red background. Other repositories listed include DBpedia_Ontology_core, EuroVoc_core, OpenMultilingualWordnet_core, RemoteHistory_core, and RemoteHistory_support, all marked as 'Local'. A hand cursor is shown pointing at the 'Test' repository. Below the modal, there are sections for 'Add statements', 'Clear graph', 'Remove statements', and 'SPARQL Select template'.

Repository	Type	Access	Total statements	Explicit	Inferred	Expansion ratio (total/explicit)
Test	Free	Read/write	18,663,165	18,663,165	0	1.00
DBpedia_Ontology_core	Local					
EuroVoc_core	Local					
OpenMultilingualWordnet_core	Local					
RemoteHistory_core	Local					
RemoteHistory_support	Local					

Import (1/2)

The screenshot shows the GraphDB Workbench interface. The left sidebar has a 'FREE' badge and includes links for Import, Export, SPARQL, Monitor, Setup, and Help. The main area is titled 'View resource' with a search bar and 'Text' or 'Visual' options. Below this is the 'Active repository' section, which lists a 'Local' repository named 'Test'. It shows 70 total statements (0 explicit, 70 inferred) with a 1:1 expansion ratio. Buttons for Import RDF data, Import tabular data with OntoRefine, and Export RDF data are available. To the right is the 'Saved SPARQL queries' section, which contains four expandable boxes: 'Add statements', 'Clear graph', 'Remove statements', and 'SPARQL Select template', each with a corresponding SPARQL query.

GraphDB Workbench

localhost:7200

View resource

Search RDF resources... Text Visual

Import Export SPARQL Monitor Setup Help

Active repository

Local

F Test

total statements 70 0 explicit 70 inferred - expansion ratio

Import RDF data Import tabular data with OntoRefine Export RDF data

Saved SPARQL queries

Add statements

```
PREFIX dc: <http://purl.org/dc/elements/1.1/...
```

Clear graph

```
CLEAR GRAPH <http://example>
```

Remove statements

```
PREFIX dc: <http://purl.org/dc/elements/1.1/...
```

SPARQL Select template

```
SELECT ?s ?p ?o WHERE { ?s ?p ?o . } LIMIT 1...
```

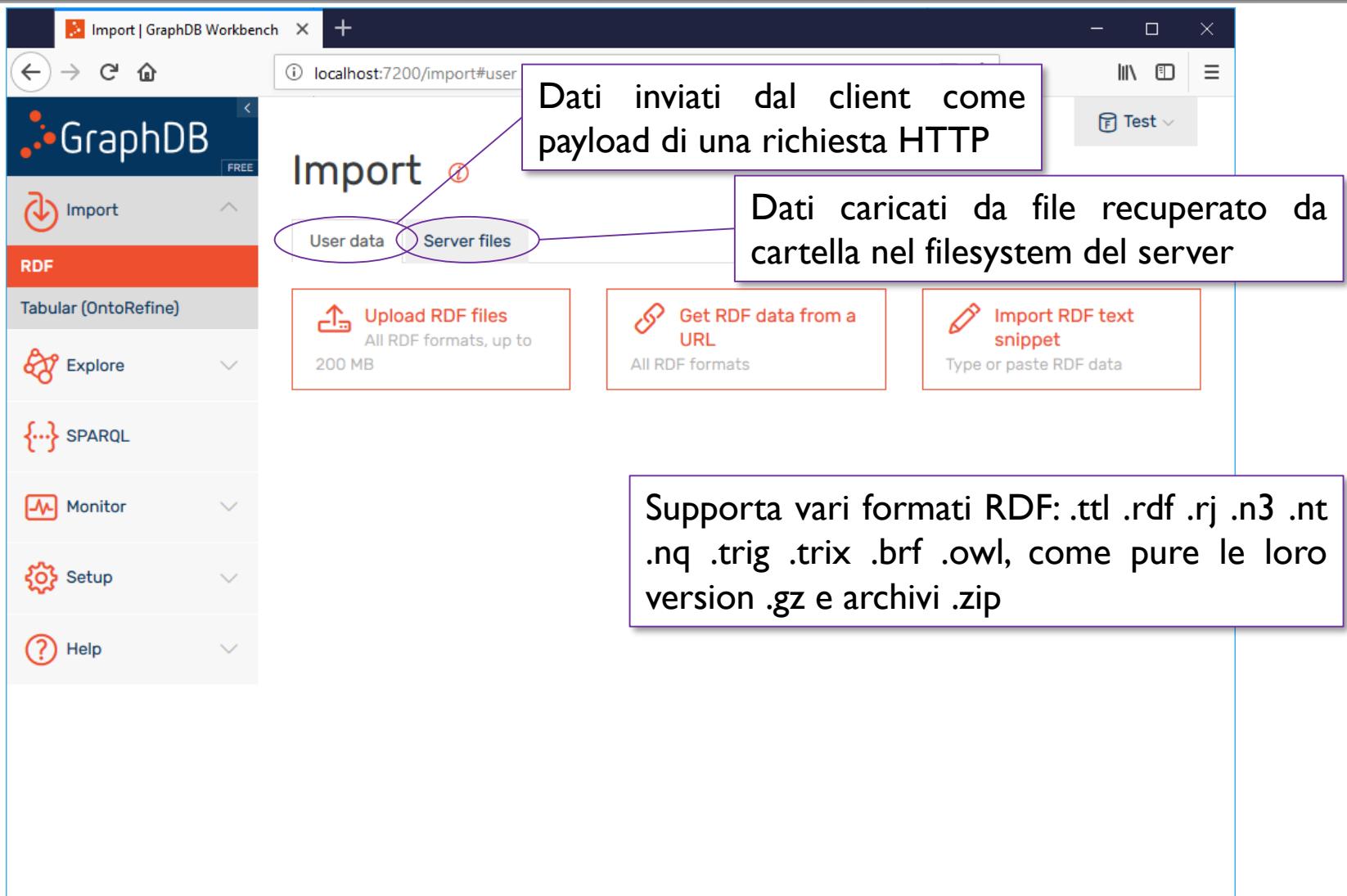
License

GraphDB Free Edition

Import (2/2)

The screenshot shows the GraphDB Workbench interface. On the left, the sidebar has sections: Import (highlighted with a black arrow), RDF, Tabular (with a link to OntoRefine), Explore, SPARQL, Monitor, Setup, and Help. The main area is titled "View resource" with a search bar and "Text" and "Visual" tabs. Below it is the "Active repository" section for "Test", which shows 70 total statements (0 explicit, 70 inferred) and an expansion ratio. It includes links for Import RDF data, Import tabular data with OntoRefine, and Export RDF data. To the right is the "Saved SPARQL queries" section with options for Add statements, Clear graph, Remove statements, and SPARQL Select template. At the bottom, there's a "License" section and a footer with the URL localhost:7200/import and the text "GraphDB Free Edition".

Import RDF



Caricamento della prima ontologia

Vogliamo caricare la nostra prima ontologia...

...in particolare, una *ontologia che parli delle persone e delle loro relazioni sociali*.

Andiamo su Linked Open Vocabularies (LOV):

<https://lov.linkeddata.es/>

- Un catalogo (curato!) di vocabolari
- Metadati rappresentati in RDF usando VoID, VOAF ed altri vocabolari
- Copia cache dei vocabolari
- Catalogo accessibile via dump, SPARQL endpoint o API
- Fulltext search sui termini definiti dai vocabolari indicizzati

LOV - Homepage

The screenshot shows a web browser window displaying the LOV homepage at <https://lov.linkeddata.es/dataset/lov/>. The page features a navigation bar with links to VOCABS, TERMS, AGENTS, and SPARQL/DUMP. A large teal header box contains the text "Linked Open Vocabularies (LOV)". Below the header are several action buttons: "+ Suggest", "Documentation", "g+ Follow", a search bar, and a help icon. To the left, a circular bubble chart titled "651 Vocabularies in LOV" shows the distribution of vocabularies, with large bubbles for "vann", "foaf", and "skos". On the right, a section titled "Latest insertion" lists "eupont" and "ocds" with their respective details.

Linked Open Vocabularies (LOV)

+ Suggest Documentation g+ Follow

651 Vocabularies in LOV

vann foaf skos

Latest insertion

eupont - EUPont: an ontology for End User Programming of the IoT
2018-10-15

ocds - Schema for an Open Contracting Release (OCDS)
2018-07-03

LOV – Ricerca (con completamento)

The screenshot shows a web browser window displaying the LOV (Linked Open Vocabularies) dataset. The URL in the address bar is <https://lov.linkeddata.es/dataset/lov/>. The page features a navigation menu with links to VOCABS, TERMS, AGENTS, and SPARQL/DUMP. A large teal header box contains the text "Linked Open Vocabularies (LOV)". Below the header are several buttons: "+ Suggest", "Documentation", "g+ Follow", and a search icon. A search input field contains the prefix "per|". A dropdown menu lists suggestions: "Person", "person", "Performer", "Period", and "performer". To the right of the search area, there is a small icon of a robot. The main content area features a circular bubble chart titled "651 Vocabularies in LOV" with three prominent bubbles labeled "vann", "foaf", and "skos". To the right of the chart, there is a list of ontology entries:

- EUPont: an ontology for End User Programming of the IoT
2018-10-15
- ocds - Schema for an Open Contracting Release (OCDS)
2018-07-03

LOV – Risultati della ricerca

The screenshot shows a web browser window for the LOV dataset. The URL is <https://lov.linkeddata.es/dataset/lov/terms?q=Person>. The interface has tabs for VOCABS, TERMS, AGENTS, and SPARQL/DUMP. The TERMS tab is selected, and the search term 'Person' is entered.

TERMS Person

1996 results

Term	Description	Score
foaf:Person (foaf)	2,320,027 occurrences in 72,000 datasets http://xmlns.com/foaf/0.1/Person	0.650
npg:Person (npg)	n/a (use in LOD) http://ns.nature.com/terms/Person	0.556
bbccore:Person (bbccore)	n/a (use in LOD) http://www.bbcbio.org/ontologies/core/bbcore#Person	0.511

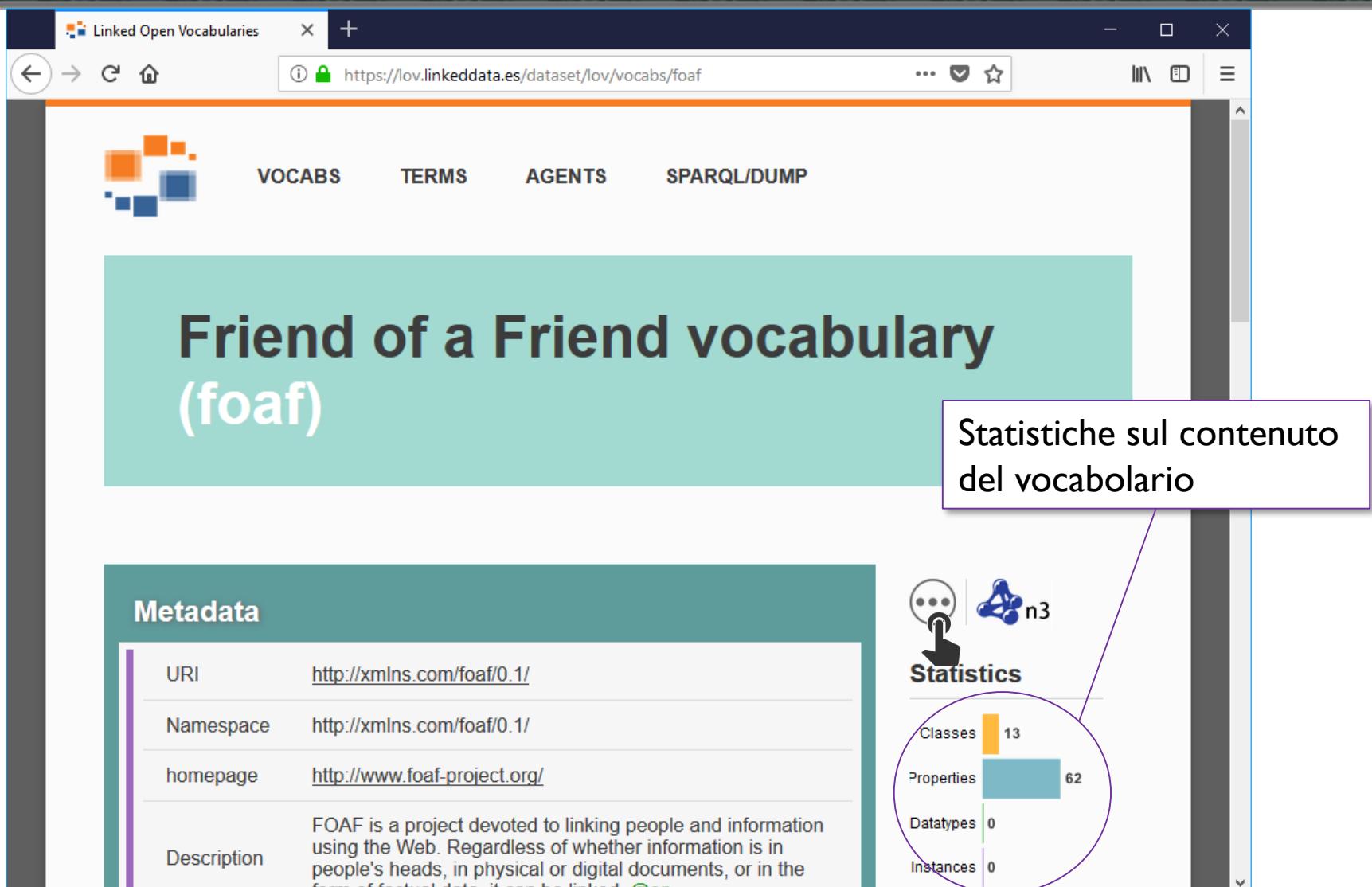
Type

- vocabulary >
- property/class
- property (1561)
- class (435)

Tag

- FRBR (577)

LOV – FOAF (1)



Friend of a Friend vocabulary (foaf)

Statistiche sul contenuto del vocabolario

Statistic	Value
Classes	13
Properties	62
Datatypes	0
Instances	0

LOV – FOAF (2)

LOV integra diversi servizi esterni:

WebVOWL (<http://visualdataweb.de/webowl/>)

per visualizzare il vocabolario come un grafo

OOPS! (OntOlogy Pitfall Scanner)

(<http://oops.linkeddata.es>)

per rilevare potenziali problemi dentro l'ontologia

Parrot

per generare una documentazione HTML

dell'ontologia

Vapour

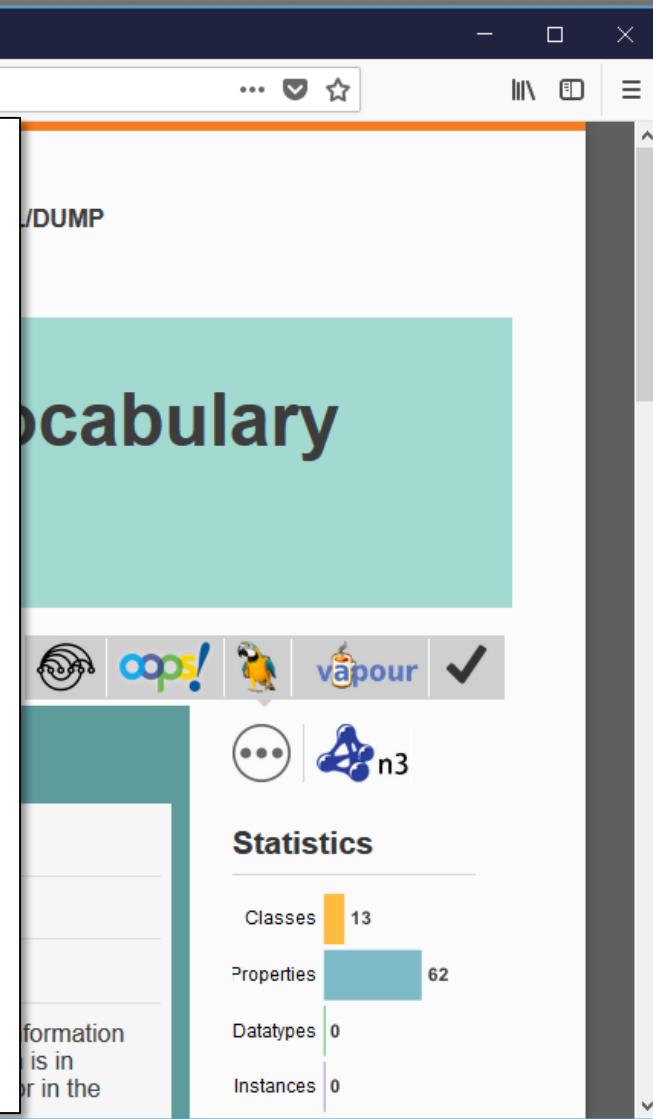
(<http://linkeddata.uriburner.com:8000/vapour>)

per verificare il funzionamento della
dereferenziazione

RDF Triple-Checker

(<http://graphite.ecs.soton.ac.uk/checker/>)

Per rilevare errori di battitura e altri problemi
comuni all'interno di dati RDF



LOV – FOAF (3)

FOAF is a project devoted to linking people and information using the Web. Regardless of whether information is in

Espressività del linguaggio di rappresentazione usato dal vocabolario

Tag per la classificazione dei vocabolari

Creator
Dan Brickley
<http://google.com/+DanBrickley>

Statistiche d'uso recuperate da LODStats (<http://stats.lod2.eu/>)

Comment

(2013-06-04) Bernard Vatant: From the specification : "FOAF has been evolving gradually since its creation in mid-2000. There is now a stable core of classes and properties that will not be changed, beyond modest adjustments to their documentation to track implementation feedback and emerging best practices."

(2014-12-16) Bernard Vatant: Annual review OK

(2014-01-15) Bernard Vatant: Looking forward for v1.0 :)

(2015-12-16) Ghislain Atemezing: Annual review OK

Datatypes 0
Instances 0

Expressivity

RDF RDFS

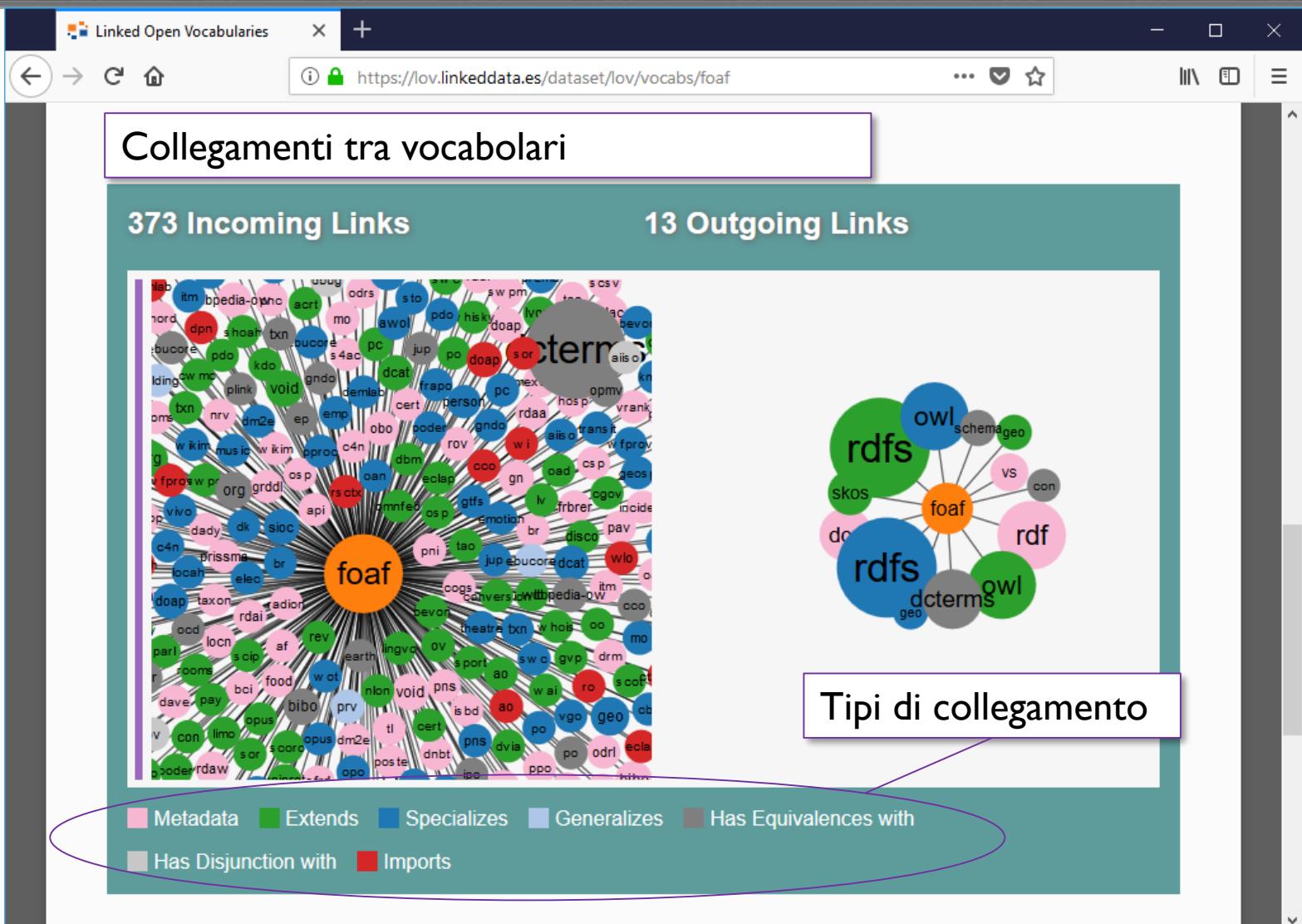
Tags

People

LOD

Vocabulary used in 249 datasets

LOV – FOAF (4)



LOV – FOAF (5)

The screenshot shows a web browser window for "Linked Open Vocabularies" displaying the "Vocabulary Version History" for the "foaf" dataset. The timeline shows a series of versions starting at v0.98 in 2011, followed by v0.99 in 2014, and ending at v0.99 in 2018. A purple oval highlights the "Timeline" label on the left side of the chart.

Accesso alle versioni precedenti del vocabolario

Vocabulary Version History

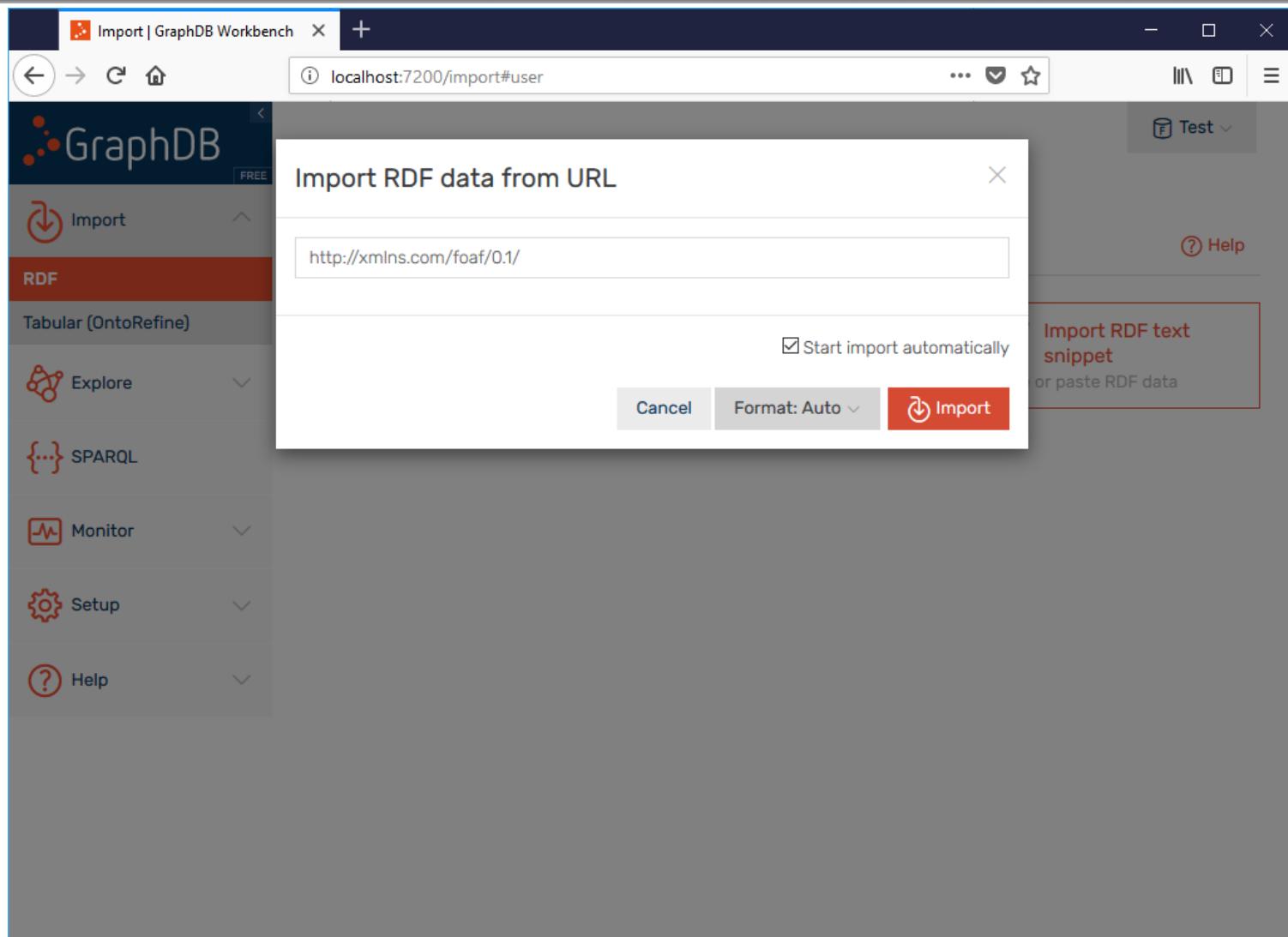
Timeline: v0.98 (2011), v0.99 (2014), v0.99 (2018)

DOCUMENTATION
[About](#)
[API documentation](#)
[Source code](#)
[Contact](#)

PUBLICATION
[Semantic Web Journal '16](#)
[ERCIM News '14](#)
[Library Hi Tech '13](#)

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Import di dati RDF da URL (1/3)



Import di dati RDF da URL (2/3)

The screenshot shows the 'Import settings' dialog in GraphDB Workbench. The 'Base IRI' field contains 'http://exampleuri.com/examplepath'. Under 'Target graphs', the 'Named graph' radio button is selected, with 'http://xmlns.com/foaf/0.1/' entered. A purple callout box labeled 'In quale grafo mettere i dati?' points to this section. Below it, the 'Replace existing data' checkbox is checked, and a note states 'I understand that data in the replaced graphs will be cleared before importing new data.' A purple callout box labeled 'Sovrascrive i dati già esistenti nel grafo di destinazione?' points to this note. At the bottom right are 'Cancel' and 'Import' buttons. A purple callout box labeled 'Configurazioni avanzate (es. preservare bnode id, checking sintattici, etc.)' points to the 'Show advanced settings' link.

In quale grafo mettere i dati?

Sovrascrive i dati già esistenti nel grafo di destinazione?

Configurazioni avanzate (es. preservare bnode id, checking sintattici, etc.)

Import di dati RDF da URL (3/3)

The screenshot shows the GraphDB Workbench interface for importing RDF data. The left sidebar has 'RDF' selected. The main area is titled 'Import' with tabs for 'User data' and 'Server files'. Three options are shown: 'Upload RDF files' (red box), 'Get RDF data from a URL' (red box), and 'Import RDF text snippet' (red box). Below these, a list shows an import task for 'http://xmlns.com/foaf/0.1/' which is currently 'Importing...'. A search bar at the bottom says 'Type to filter'.

Visualizzazione

Disporre di **opportune visualizzazioni** è indispensabile per comprendere i dati e generare approfondimenti (insight)

GraphDB offre diverse visualizzazioni:

- resource view (visualizzazione/editing delle triple)
- visual graph (connettività delle risorse)
- domain-range graph (relazioni tra classi)
- class relationships (relazioni tra istanze delle classi)

RDF Rank permette di determinare l'«importanza» delle risorse, e ciò influisce sulle visualizzazioni esaltando certe parti dei dati e tagliandone altre.

Explore

The screenshot shows the GraphDB Workbench interface with the title "Import | GraphDB Workbench". The left sidebar has a "SPARQL" option highlighted with a large black hand cursor icon pointing at it. The main area is titled "Import" and contains three options: "Upload RDF files", "Get RDF data from a URL", and "Import RDF text snippet". Below these is a list of imported resources, starting with "http://xmlns.com/foaf/0.1/" which was imported successfully. A search bar and a "Type to filter" input field are also visible.

Explore – Graph Overview (1/2)

The screenshot shows the GraphDB Workbench interface for importing RDF data. The left sidebar has a 'Import' tab selected. The main area is titled 'Import' with tabs for 'User data' and 'Server files'. Three options are shown: 'Upload RDF files' (with a 200 MB limit), 'Get RDF data from a URL', and 'Import RDF text snippet'. Below these is a list of imported resources, starting with 'http://xmlns.com/foaf/0.1/' which was imported successfully in less than a second. A search bar and a 'Type to filter' input are also present.

Explore – Graph Overview (2/2)

The screenshot shows the GraphDB web interface at `localhost:7200/graphs`. The left sidebar has a red highlight on the 'Graphs overview' item. The main area displays a list of graphs:

- Graphs
- The default graph
- <http://xmlns.com/foaf/0.1/>

A large black hand cursor icon is positioned over the third graph entry.

Explore – Resource view (1/2)

Un resource view in cui sono mostrati gli statement che hanno una certa risorsa come contesto

È possibile mostrare gli statement che hanno una certa risorsa come soggetto, predicato o oggetto

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

	subject	predicate	object	context
1	foaf:	dc11:description		
2	foaf:	dc11:title		
3	foaf:	rdf:type	owl:Ontology	
4	foaf:Agent	rdf:type	rdfs:Class	
5	foaf:Agent	rdf:type	owl:Class	
6	foaf:Agent	rdfs:comment	An agent (e.g. person, group, software or physical artifact).	foaf:
7	foaf:Agent	rdfs:isDefinedBy	foaf:	foaf:
8	foaf:Agent	rdfs:label	Agent	foaf:
9	foaf:Agent	owl-equivalentClass	dcterms:Agent	foaf:

Mostrare bnode

Scaricare i dati

Show Blank Nodes

Download as

Visual graph

Mostrare solo statement esplicativi, impliciti o entrambi

Aprire visual graph sulla risorsa

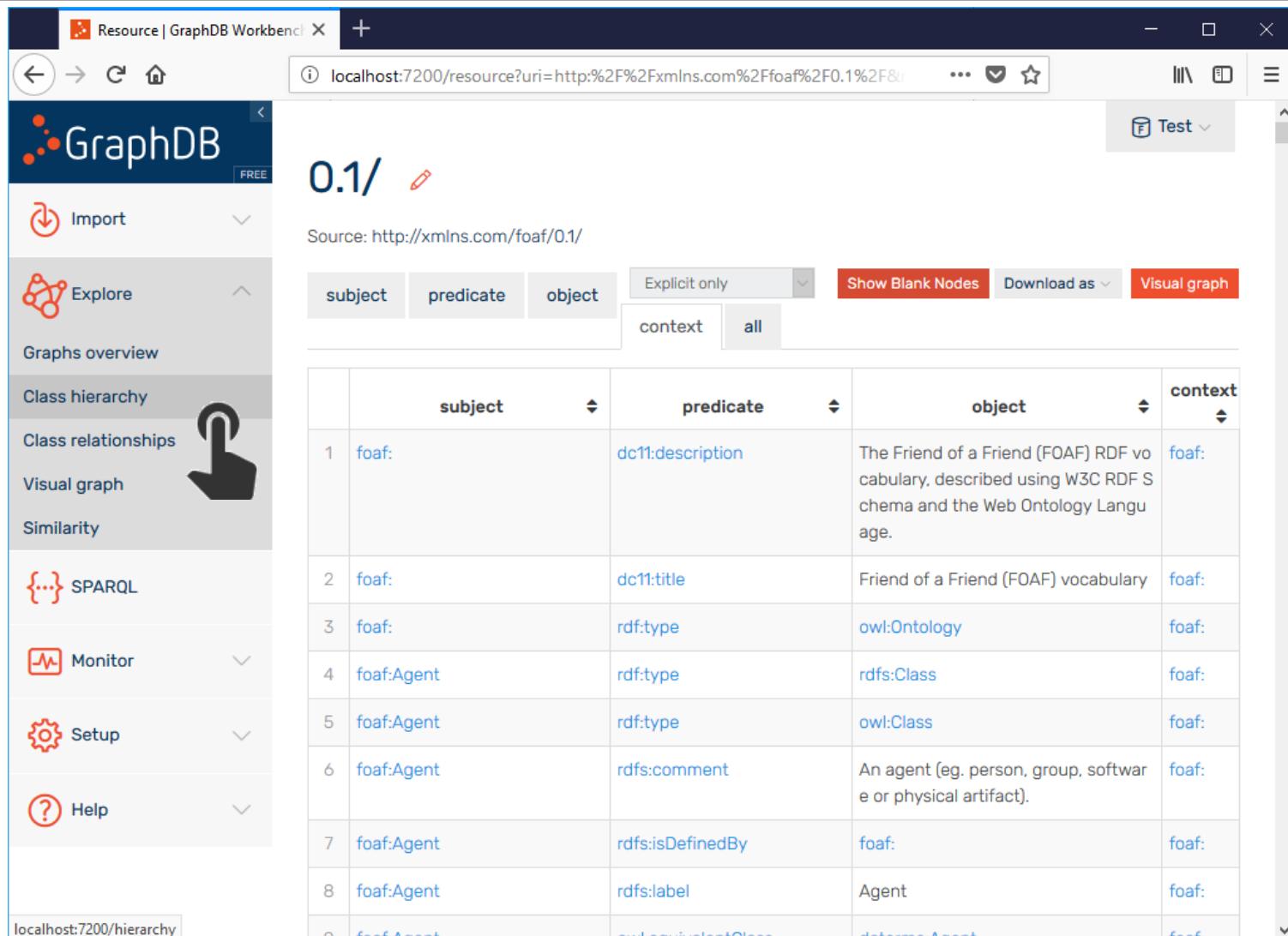
Explore – Resource view (2/2)

Il resource view è una visualizzazione ad elevata risoluzione, utile per vedere nel dettaglio:

- Ciò che si conosce su una risorsa (*come soggetto*)
- Riferimenti ad una risorsa (*come oggetto*)
- Usi di una risorsa *come predicato*

Può anche essere usato per *editare gli statement* e *definire nuove risorse*.

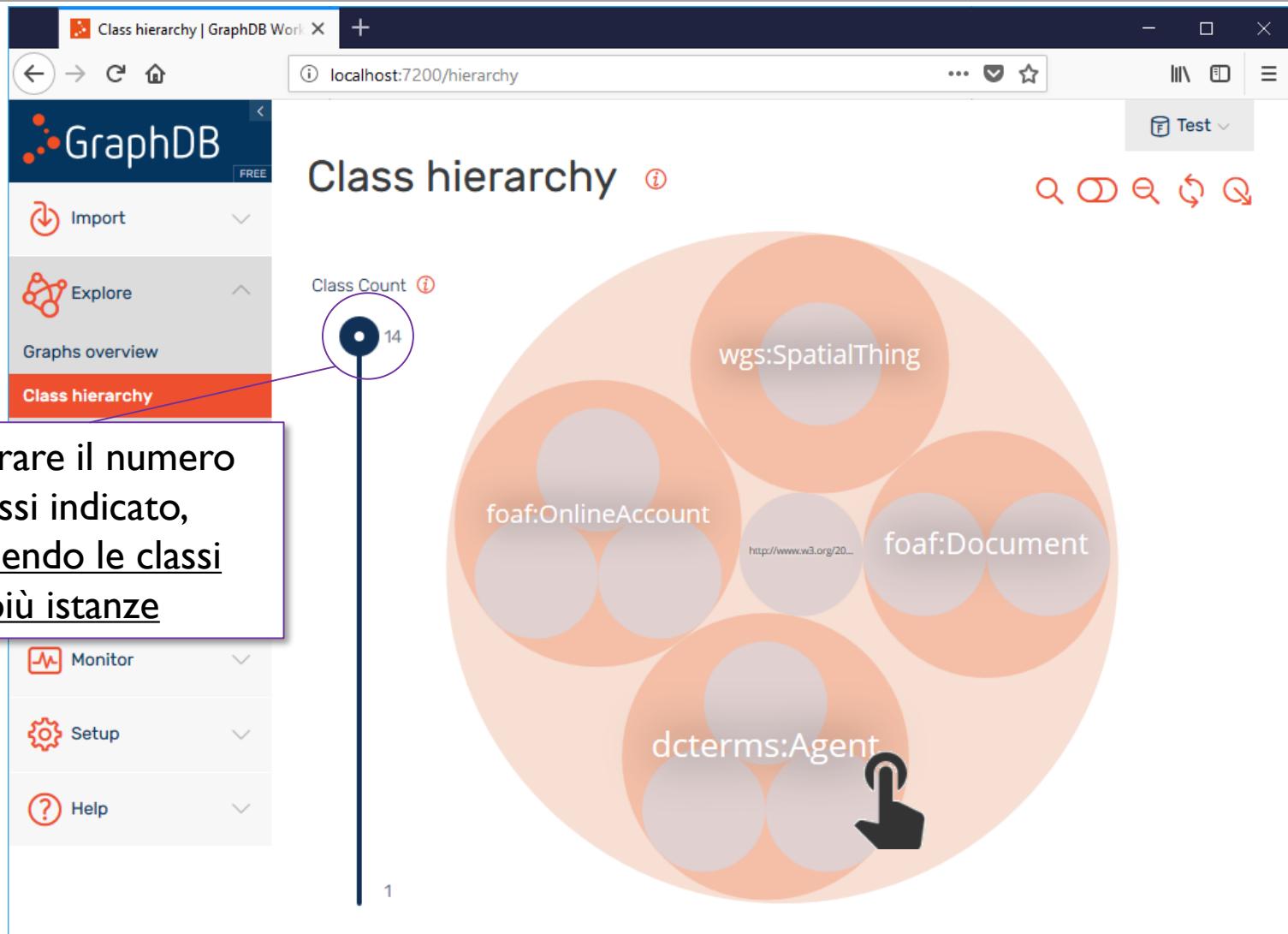
Explore – Class Hierarchy (1/5)



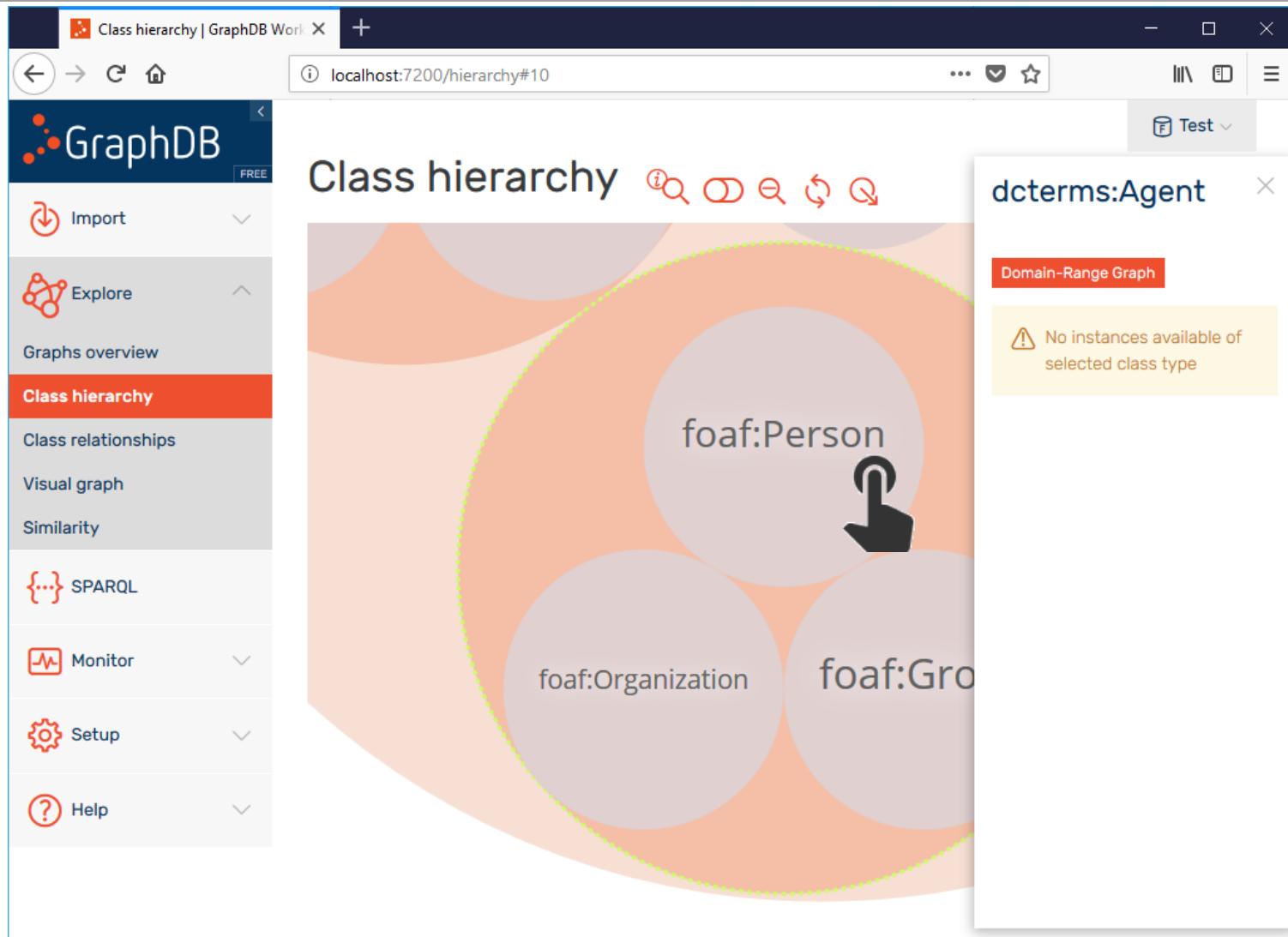
The screenshot shows the GraphDB Workbench interface. On the left, the sidebar has 'Explore' selected. A large red hand icon is placed over the 'Class hierarchy' link. The main area displays the 'foaf' class hierarchy with the following data:

rank	subject	predicate	object	context
1	foaf:	dc11:description	The Friend of a Friend (FOAF) RDF vocabulary, described using W3C RDF Schema and the Web Ontology Language.	foaf:
2	foaf:	dc11:title	Friend of a Friend (FOAF) vocabulary	foaf:
3	foaf:	rdf:type	owl:Ontology	foaf:
4	foaf:Agent	rdf:type	rdfs:Class	foaf:
5	foaf:Agent	rdf:type	owl:Class	foaf:
6	foaf:Agent	rdfs:comment	An agent (e.g. person, group, software or physical artifact).	foaf:
7	foaf:Agent	rdfs:isDefinedBy	foaf:	foaf:
8	foaf:Agent	rdfs:label	Agent	foaf:
9	foaf:Agent	owl-equivalentClass	dcterms:Agent	foaf:

Explore – Class Hierarchy (2/5)



Explore – Class Hierarchy (3/5)



Explore – Class Hierarchy (4/5)

The screenshot shows the GraphDB Workbench interface. The left sidebar has a red-highlighted 'Class hierarchy' option under 'Explore'. The main area displays a class hierarchy diagram for 'foaf:Person'. A callout box highlights the right-hand panel, which shows the 'Domain-Range Graph' for 'Person', stating 'A person.' and noting 'No instances available of selected class type'. The URL in the browser bar is 'localhost:7200/hierarchy#13'.

Il pannello laterale include rdfs:label, rdfs:comment, al più 1000 istanze, un pulsante per richiedere tramite SPARQL tutte le istanze, ed il pulsante per aprire la visualizzazione domain-range

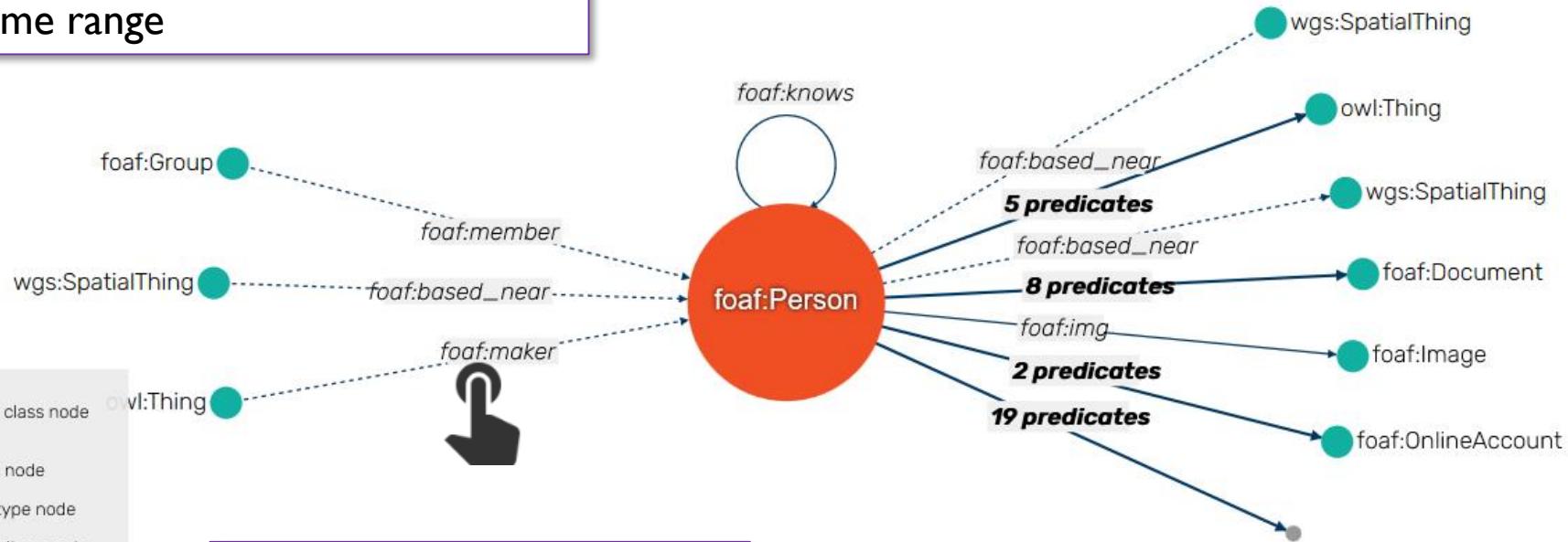
Explore – Class Hierarchy (5/5)

La visualizzazione *class hierarchy* ci permette di visualizzare ed esplorare la gerarchia delle classi.

Ci permette di limitare il numero di classi visualizzate, dando la priorità a quelle con più istanze.

Explore – Domain-Range Graph (1/3)

Proprietà che hanno *foaf:Person* come range

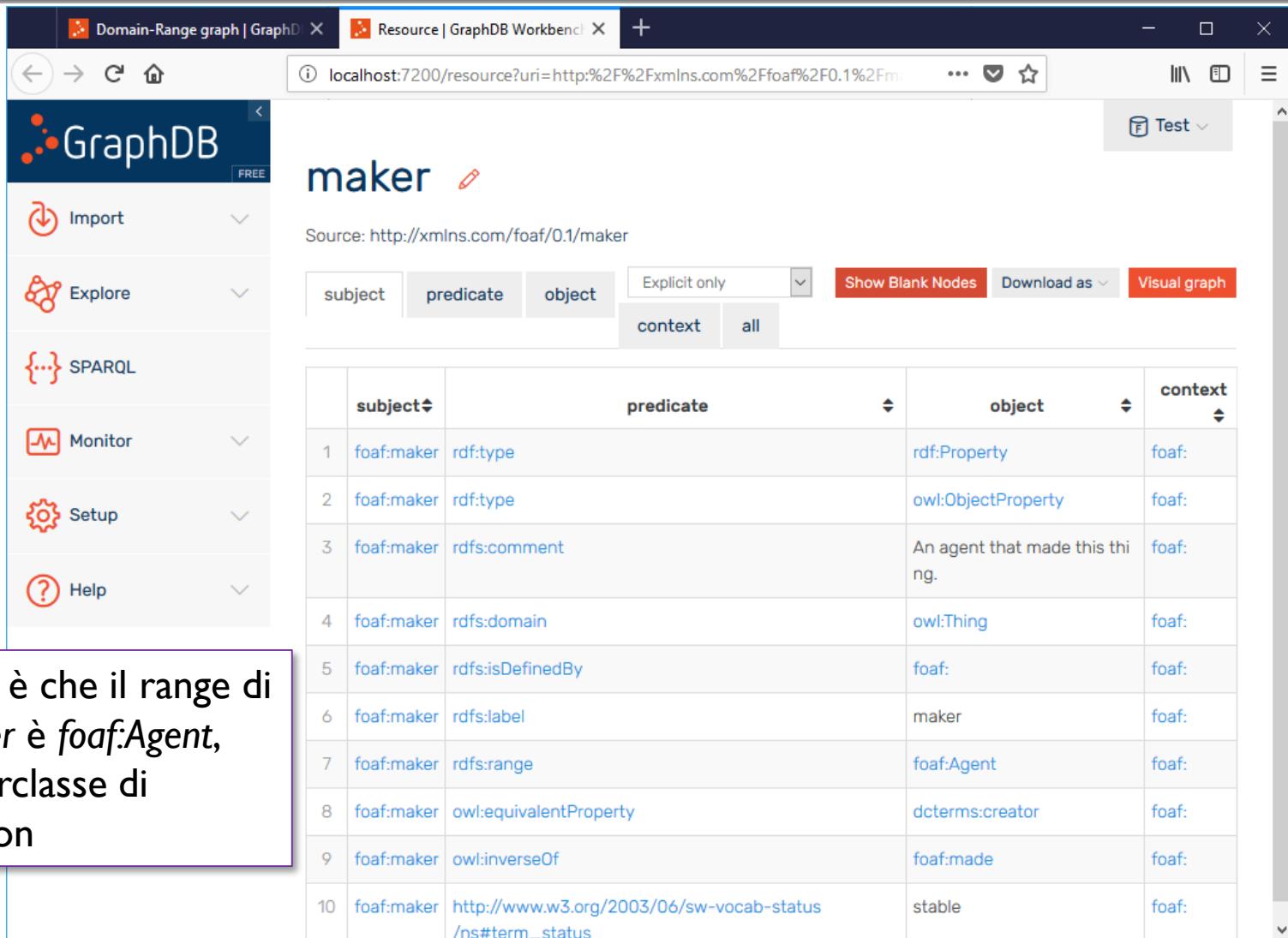


Perché *foaf:maker* è una proprietà implicita?

Proprietà che hanno *foaf:Person* come domain.

Gli elementi in grassetto indicano gruppi di proprietà con una certa combinazione di domain e range

Explore – Domain-Range Graph (2/3)



The screenshot shows the GraphDB Workbench interface with the following details:

- Title Bar:** Domain-Range graph | GraphDB X, Resource | GraphDB Workbench X
- Toolbar:** Back, Forward, Home, Refresh, Address bar (localhost:7200/resource?uri=http://xmlns.com/foaf/0.1/maker), Test dropdown.
- Left Sidebar:**
 - Import
 - Explore (selected)
 - SPARQL
 - Monitor
 - Setup
 - Help
- Main Content:**

maker

Source: <http://xmlns.com/foaf/0.1/maker>

Filter buttons: subject, predicate, object, Explicit only, Show Blank Nodes (highlighted in red), Download as, Visual graph.

Context buttons: context, all.

	subject	predicate	object	context
1	foaf:maker	rdf:type	rdf:Property	foaf:
2	foaf:maker	rdf:type	owl:ObjectProperty	foaf:
3	foaf:maker	rdfs:comment	An agent that made this thing.	foaf:
4	foaf:maker	rdfs:domain	owl:Thing	foaf:
5	foaf:maker	rdfs:isDefinedBy	foaf:	foaf:
6	foaf:maker	rdfs:label	maker	foaf:
7	foaf:maker	rdfs:range	foaf:Agent	foaf:
8	foaf:maker	owl:equivalentProperty	dcterms:creator	foaf:
9	foaf:maker	owl:inverseOf	foaf:made	foaf:
10	foaf:maker	http://www.w3.org/2003/06/sw-vocab-status/ns#term_status	stable	foaf:

Il motivo è che il range di *foaf:maker* è *foaf:Agent*, una superclasse di *foaf:Person*

Explore – Domain-Range Graph (3/3)

Il *domain-range graph* ci permette di analizzare le relazioni tra le classi (a livello assiomatico).

Il concetto di proprietà implicita ci aiuta a gestire meglio l'interazione tra dichiarazioni di domain/range e la gerarchia delle classi.

Explore – Graph Relationships – senza istanze

The currently selected repository contains no dependencies data. Please, reload the diagram if you have imported data recently.

Questo diagramma ci mostra le **relazioni tra le classi**, come sono determinate da legami tra le loro istanze (diversamente dai diagrammi precedenti basati sullo schema dell'ontologia).
Ci ritorneremo dopo aver definito alcune istanze.

Import RDF text snippet (1/4)

The screenshot shows the GraphDB Workbench interface for importing RDF data. The left sidebar has a red 'RDF' section selected. The main area is titled 'Import' with tabs for 'User data' and 'Server files'. Three options are shown: 'Upload RDF files' (with a file icon), 'Get RDF data from a URL' (with a link icon), and 'Import RDF text snippet' (with a pencil icon). A callout box over the snippet option indicates supported formats: '.ttl .rdf .n3 .nt .nq .trig .trix .owl'. Below these options, a list shows an imported item: 'http://xmlns.com/foaf/0.1/' with status 'Imported successfully in less than a second.' and an 'Import' button.

Import RDF text snippet (2/4)

The screenshot shows the GraphDB Workbench interface. On the left, there's a sidebar with icons for Import, RDF (selected), Tabular (OntoRefine), Explore, SPARQL, Monitor, Setup, and Help. The main area has a title bar "Import | GraphDB Workbench" and a URL "localhost:7200/import#user". A central modal dialog is open with the title "Import RDF data from a text snippet". Inside the dialog, there's a code editor containing two triples in Turtle format:

```
@prefix : <http://example.org/> .  
:john a foaf:Person ;  
    foaf:givenName "John" ;  
    foaf:familyName "Someone"  
  
:mary a foaf:Person ;  
    foaf:givenName "Mary" ;  
    foaf:familyName "Someone else"
```

Below the code editor, there's a checkbox "Start import automatically" which is checked. At the bottom of the dialog are "Cancel" and "Import" buttons, with "Import" being red. Outside the dialog, there are three previous imports listed:

- Text snippet 2018-10-10 19:48:45.230 (with a trash bin and Import button)
- http://xmlns.com/foaf/0.1/ (with a trash bin and Import button)

Import RDF text snippet (3/4)

```
@prefix : <http://example.org/> .
```

```
:john a foaf:Person ;
  foaf:givenName "John" ;
  foaf:familyName "Someone"
```

```
.
```

```
:mary a foaf:Person ;
  foaf:givenName "Mary" ;
  foaf:familyName "Someone else"
```

```
.
```

```
:philip a foaf:Person ;
  foaf:givenName "Philip" ;
  foaf:familyName "The One"
```

```
.
```

```
:alice a foaf:Person ;
  foaf:givenName "Alice" ;
  foaf:familyName "Cetara"
```

```
.
```

```
:john foaf:knows :mary, :philip, :alice .
:mary foaf:knows :john, :philip .
:philip foaf:knows :john, :mary .
:alice foaf:knows :john .
```

Definiamo alcune istanze di fantasia della classe foaf:Person, ed immaginiamo che alcune si conoscano (*foaf:knows*) tra di loro.

Import RDF text snippet (4/4)

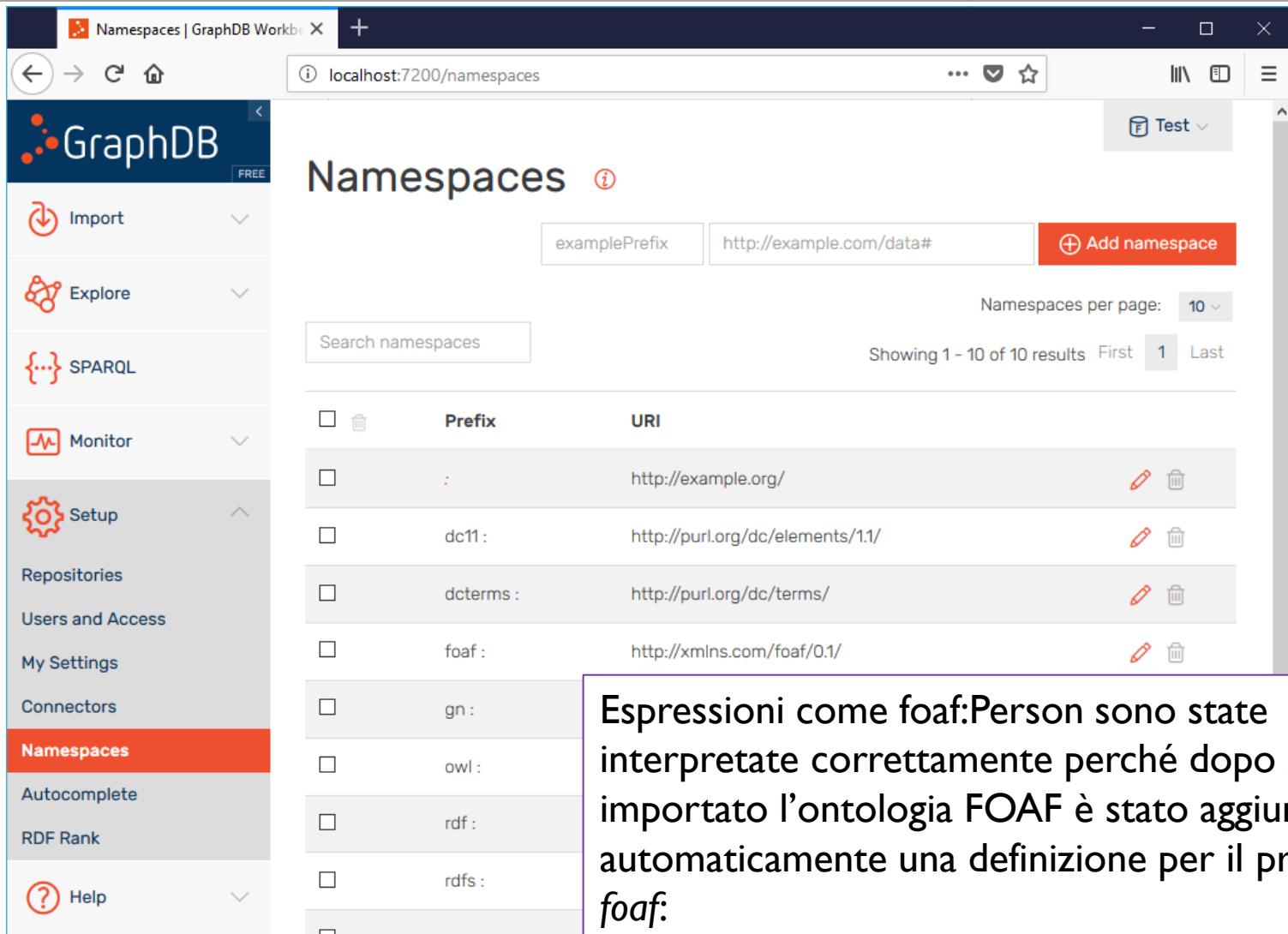
The screenshot shows the GraphDB Workbench interface. A modal dialog titled "Import settings" is open in the foreground. It contains fields for "Base IRI" (set to <http://exampleuri.com/examplepath>) and "Target graphs" (radio buttons for "From data", "The default graph", and "Named graph", with "Named graph" selected and its value set to <http://example.org/>). There is also a checkbox for "Enable replacement of existing data" which is unchecked. A "Show advanced settings" link is visible. At the bottom of the dialog are "Cancel" and "Import" buttons, with "Import" being red.

Below the dialog, a list of imported text snippets is shown:

- [Text snippet 2018-10-11 16:33:23.136](#)
× [Imported successfully in less than a second.](#) [Delete](#) [Import](#)
- [Text snippet 2018-10-11 16:25:44.755](#) [Delete](#) [Import](#)
- [Text snippet 2018-10-10 19:57:28.297](#) [Delete](#) [Import](#)
- [Text snippet 2018-10-10 19:48:45](#) [Delete](#) [Import](#)
- [http://xmlns.com/foaf/0.1](#) [Delete](#) [Import](#)

A callout box with a purple border and white text is overlaid on the bottom right of the list, containing the text: "Inseriamo le triple in un nuovo grafo chiamato <http://example.org/>".

Setup - Namespaces



The screenshot shows the GraphDB Workbench interface for managing namespaces. The left sidebar has a 'Setup' section with 'Namespaces' highlighted in red. The main area displays a list of registered namespaces:

<input type="checkbox"/>	Prefix	URI	<input type="button" value="Edit"/>	<input type="button" value="Delete"/>
<input type="checkbox"/>	:	http://example.org/	<input type="button" value="Edit"/>	<input type="button" value="Delete"/>
<input type="checkbox"/>	dc11:	http://purl.org/dc/elements/1.1/	<input type="button" value="Edit"/>	<input type="button" value="Delete"/>
<input type="checkbox"/>	dcterms:	http://purl.org/dc/terms/	<input type="button" value="Edit"/>	<input type="button" value="Delete"/>
<input type="checkbox"/>	foaf:	http://xmlns.com/foaf/0.1/	<input type="button" value="Edit"/>	<input type="button" value="Delete"/>
<input type="checkbox"/>	gn:			
<input type="checkbox"/>	owl:			
<input type="checkbox"/>	rdf:			
<input type="checkbox"/>	rdfs:			
<input type="checkbox"/>	wgs:			

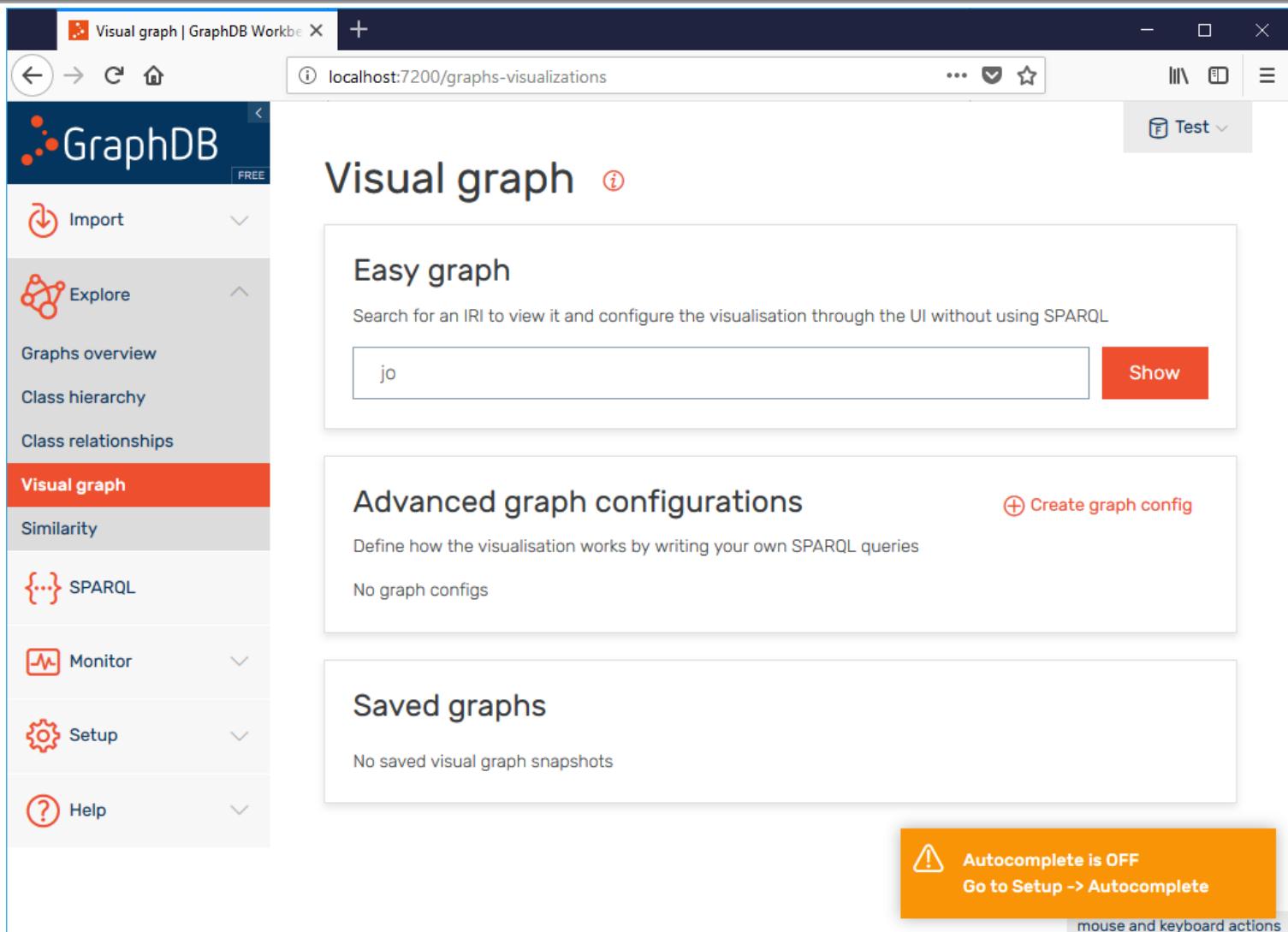
A callout box highlights the 'foaf:' prefix entry with the following text:

Espressioni come foaf:Person sono state interpretate correttamente perché dopo aver importato l'ontologia FOAF è stato aggiunta automaticamente una definizione per il prefisso foaf:

Visual graph (1/10)

The screenshot shows the GraphDB Workbench interface running in a browser window at `localhost:7200/graphs-visualizations`. The left sidebar has a red header bar with 'Visual graph' selected. Other options include Import, Explore, Graphs overview, Class hierarchy, Class relationships, Similarity, SPARQL, Monitor, Setup, and Help. The main content area has three sections: 'Easy graph' (with a search bar and 'Show' button), 'Advanced graph configurations' (with a 'Create graph config' button), and 'Saved graphs' (which is currently empty). A status bar at the bottom right says 'mouse and keyboard actions'.

Visual graph (2/10)



The screenshot shows the GraphDB Workbench interface running in a browser window at `localhost:7200/graphs-visualizations`. The left sidebar has a red highlight over the "Visual graph" item, indicating it is active. The main content area displays three sections: "Easy graph", "Advanced graph configurations", and "Saved graphs".

- Easy graph:** A search bar contains the text "jo", and a red "Show" button is to its right.
- Advanced graph configurations:** A red "+ Create graph config" button is visible. Below it, a message says "Define how the visualisation works by writing your own SPARQL queries" and "No graph configs".
- Saved graphs:** A message says "No saved visual graph snapshots".

A yellow warning banner at the bottom right states: "Autocomplete is OFF" and "Go to Setup -> Autocomplete". Below the banner, a note says "mouse and keyboard actions".

Autocompletamento (1/2)

The screenshot shows the GraphDB web interface at `localhost:7200/autocomplete`. The left sidebar has a red bar highlighting the "Autocomplete" section. The main page displays the "Autocomplete index" configuration. It includes a note to "Click to enable autocomplete" and a toggle switch for "Autocomplete for repository Test" which is currently "OFF". Below this, there's a section for "Label IRI" with the value `http://www.w3.org/2000/01/rdf-schema#label` and a "Languages" section set to "any language". A "Setup" section on the left contains links for "Repositories", "Users and Access", "My Settings", "Connectors", "Namespaces", "Autocomplete" (which is red), "RDF Rank", and "Help".

Autocompletamento (2/2)

The screenshot shows the GraphDB web interface at `localhost:7200/autocomplete`. The left sidebar has a red bar highlighting the **Autocomplete** section. The main area displays the "Autocomplete index" configuration. It shows that autocomplete for repository **Test** is **ON** and ready. There is a "Build Now" button. Below this, there is a section for "Label IRI" with the value `http://www.w3.org/2000/01/rdf-schema#label` and a "Languages" section set to "any language".

Visual graph (3/10)

The screenshot shows the GraphDB Workbench interface running in a browser window at `localhost:7200/graphs-visualizations`. The left sidebar has a red highlight on the 'Visual graph' item. The main content area is titled 'Visual graph' and contains three sections: 'Easy graph', 'Advanced graph configurations', and 'Saved graphs'. In the 'Easy graph' section, a search bar shows 'jo' and a result 'http://example.org/john' is listed with a 'Show' button. In the 'Advanced graph configurations' section, there is a link to 'Create graph config'. The 'Saved graphs' section indicates 'No saved visual graph snapshots'. A 'mouse and keyboard actions' button is visible at the bottom right.

Visual graph | GraphDB Workbe X +

localhost:7200/graphs-visualizations

Visual graph

Easy graph

Search for an IRI to view it and configure the visualisation through the UI without using SPARQL

jo

Show

http://example.org/john

Advanced graph configurations

Create graph config

Define how the visualisation works by writing your own SPARQL queries

No graph configs

Saved graphs

No saved visual graph snapshots

mouse and keyboard actions

Visual graph (4/10)

Visual graph

philip

alice

john

mary

Tante possibilità di configurazione

Grafo visuale delle connessioni focalizzato sulla risorsa :john.

mouse and keyboard actions

Visual graph (5/10)

Il *visual graph* ci permette di visualizzare ed esplorare le relazioni tra le risorse.

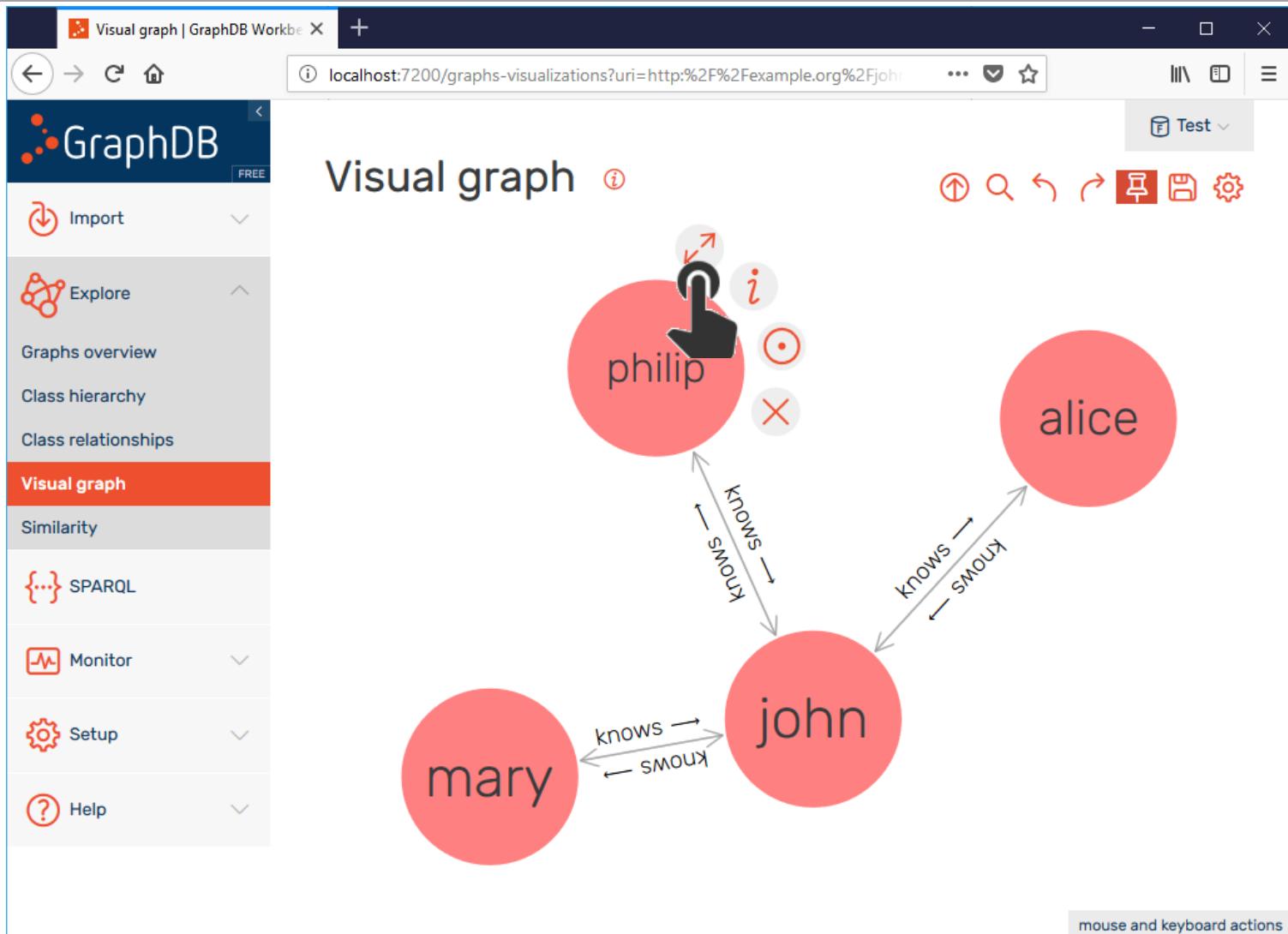
Per default, mostra al più 20 connessioni ad altre risorse ordinate per RDF Rank (se calcolato)

→ concentrarsi sulle connessioni più importanti (o meglio, alle risorse più importanti)

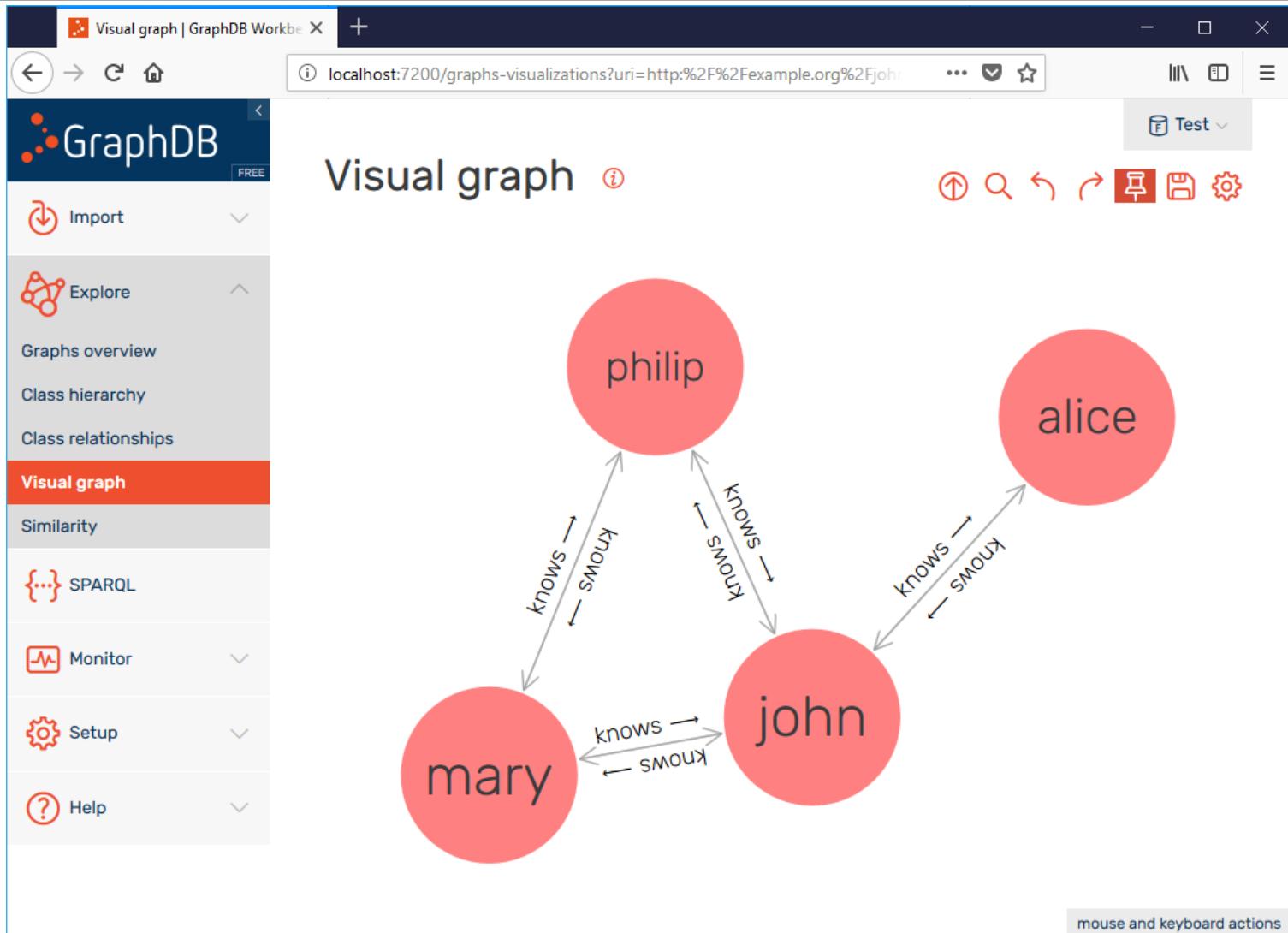
I nodi associati alle diverse risorse hanno un colore determinato dalla classe di appartenenza, ed hanno una dimensione che esprime il loro RDF Rank (se calcolato)

→ Discriminare l'importanza di una risorsa

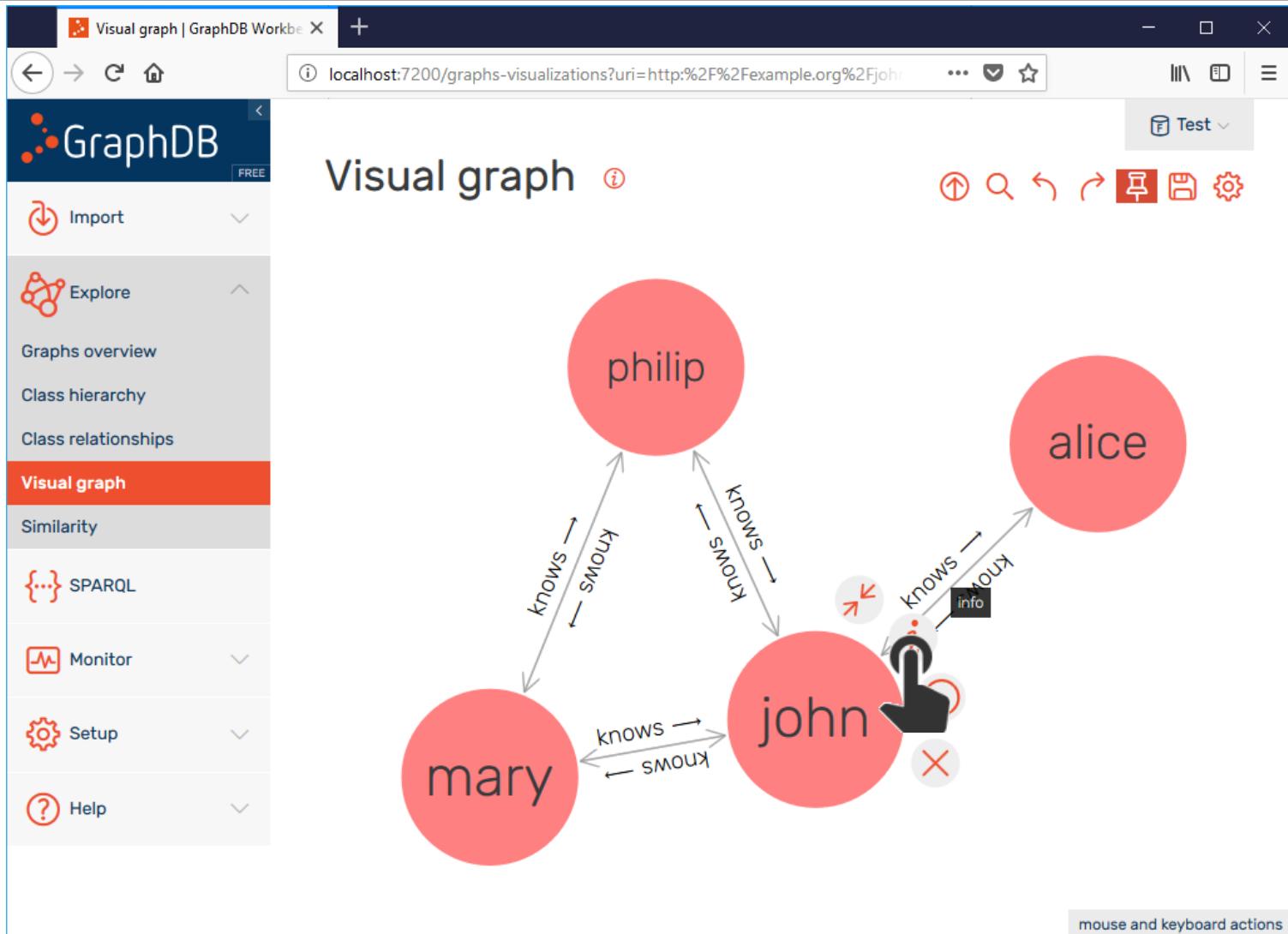
Visual graph (6/10)



Visual graph (7/10)



Visual graph (8/10)



Visual graph (9/10)

Visual graph

john

Types:
foaf:Person

RDF rank:
0

foaf:familyName Someone

foaf:givenName John

Il pennello laterale include **rdfs:label**, **rdfs:comment**, **i tipi**, **RDF Rank**, **foaf:depiction** (visualizzata come figura), tutte le **datatype property**

RDF Rank (1/4)

The screenshot shows the GraphDB Workbench interface running in a browser window at `localhost:7200/rdfrank`. The left sidebar is titled "GraphDB FREE" and contains the following navigation items:

- Import
- Explore
- SPARQL
- Monitor
- Setup (selected)
- Repositories
- Users and Access
- My Settings
- Connectors
- Namespaces
- Autocomplete
- RDF Rank (highlighted in orange)
- Help

The main content area is titled "RDF Rank" with an information icon. It displays the message: "RDFRank for repository Test is with status i RDFRank not built yet". To the right of this message is a red button labeled "Compute Full". Below this, there is a section titled "Filtering" with a toggle switch set to "OFF". A large, semi-transparent hand icon is overlaid on the main content area.

RDF Rank (2/4)

The screenshot shows the GraphDB Workbench interface for performing an RDFRank calculation. The main title is "RDF Rank". Below it, a message states "RDFRank for repository Test is with status Computed". A prominent red button labeled "Compute Full" is visible, with a large black hand cursor pointing at it. On the left, a sidebar menu is open, showing various options like Import, Explore, SPARQL, Monitor, Setup, and RDF Rank, with "RDF Rank" currently selected. The central area contains filtering options for explicit and implicit statements, and sections for included and excluded graphs.

RDF Rank (3/4)

RDF Rank determina l'importanza di un nodo in un grafo RDF esaminando le sue interconnessioni:

Molto simile all'algoritmo PageRank utilizzato da Google per ordinare i risultati di una ricerca (assieme a molti altri segnali!)

Il PageRank di una pagina Web è il suo *long-term visit rate* di un utente che naviga sul Web seguendo con equiprobabilità i link uscenti da ciascuna pagina

Questo processo è modellato come una catena di Markov a tempo discreto.

Affinché il long-term visit rate sia definito è necessario che la catena di Markov sia *ergodica*.

A tale scopo, la catena è modificata in modo che i) giunto a un dead end (pagina senza link uscenti), l'utente salti con equiprobabilità in una qualsiasi pagina del web, ii) in ogni istante, c'è una probabilità (teleportation rate) che l'utente salti ad una qualunque pagina Web (teleporting) anziché seguire uno dei link uscenti

RDF Rank (4/4)

Dietro le quinte RDF Rank viene **configurato inviando opportuni UPDATE SPARQL** al repository.

In aggiunta al **ricomputo completo**, viene offerta la possibilità di un **ricomputo incrementale**:

Utilizza un algoritmo più veloce rispetto a quello usato nel ricomputo completo dell'RDF Rank, che introduce però alcune approssimazioni. In un contesto di aggiornamenti frequenti alla base di conoscenza, l'algoritmo incrementale permette un aggiornamento più efficiente del rango delle risorse.

Utilizzo di algoritmi per grafi

RDF Rank ci mostra che è possibile applicare comuni algoritmi per grafi ai dati RDF.

In altre parole, RDF può non solo essere visualizzato come un grafo, ma anche elaborato come un grafo.

Visual graph (10/10)

The screenshot shows the GraphDB Workbench interface with the "Visual graph" tab selected. The main area displays a network graph with four nodes: "philip", "john", "alice", and "mary". The nodes are represented as red circles of different sizes, with "john" being the largest. Edges between the nodes are labeled "knows" and are shown as arrows pointing from one node to another. A tooltip for the node "john" provides the following information:

- Types:** foaf:Person
- RDF rank:** 0.76
- foaf:familyName:** Someone
- foaf:givenName:** John

A callout box contains the text: "L'RDF Rank delle risorse viene mostrato nel pannello laterale, determina la dimensione dei nodi e quali connessioni vengono mostrate."

Rendiamo più interessante la descrizione delle istanze (1/3)

The screenshot shows the GraphDB Workbench interface. On the left, the sidebar has options: Import, RDF (selected), Tabular (OntoRefine), Explore, SPARQL, Monitor, Setup, and Help. The main area shows a browser window at localhost:7200/import#user. A modal dialog titled "Import RDF data from a text snippet" contains the following RDF text:

```

:john foaf:homepage <http://example.org/users/john> .
<http://example.org/users/john> a foaf:Document .

:mary foaf:homepage <http://example.org/users/mary> .
<http://example.org/users/mary> a foaf:Document .

:philip foaf:homepage <http://example.org/users/philip> .
<http://example.org/users/philip> a foaf:Document .

:alice foaf:homepage <http://example.org/users/alice> .
<http://example.org/users/alice> a foaf:Document .

```

Below the text, there is a checkbox "Start import automatically" and two "Import" buttons (one in red). Below the dialog, a list of previous imports is shown:

- [Text snippet 2018-10-11 17:13:04.567](#) Import
- [Text snippet 2018-10-11 17:12:33.702](#) Import
× ⓘ Imported successfully in less than a second.
- [Text snippet 2018-10-11 17:09:24.966](#) Import
× ⓘ Imported successfully in less than a second.

Rendiamo più interessante la descrizione delle istanze (2/3)

```
@prefix : <http://example.org/> .

:bigGroup a foaf:Group ;
    foaf:name "Big Group" ;
    foaf:member :john, :mary, :philip .

:mediumGroup a foaf:Group ;
    foaf:name "Medium Group" ;
    foaf:member :john, :alice .

:john foaf:homepage
<http://example.org/users/john> .
<http://example.org/users/john> a
foaf:Document .
```

:mary foaf:homepage
 <http://example.org/users/mary> .
 <http://example.org/users/mary> a
 foaf:Document .

:philip foaf:homepage
 <http://example.org/users/philip> .
 <http://example.org/users/philip> a
 foaf:Document .

:alice foaf:homepage
 <http://example.org/users/alice> .
 <http://example.org/users/alice> a
 foaf:Document .

Rendiamo più interessante la descrizione delle istanze (3/3)

The screenshot shows the GraphDB Workbench interface. A modal dialog titled "Import settings" is open in the foreground. It contains fields for "Base IRI" (set to <http://exampleuri.com/examplepath>) and "Target graphs" (radio buttons for "From data", "The default graph", and "Named graph", with "Named graph" selected and its value set to <http://example.org/>). There is also a checkbox for "Enable replacement of existing data" which is unchecked. Below these fields is a "Show advanced settings" link. At the bottom of the dialog are "Cancel" and "Import" buttons, with "Import" being red.

Below the dialog, a list of imported snippets is displayed:

- [Text snippet 2018-10-11 17:07:11.335](#) Imported successfully in less than a second. [Import](#)
- [Text snippet 2018-10-11 16:55:06.481](#) Imported successfully in less than a second. [Import](#)
- [Text snippet 2018-10-11 16:33:23.136](#) Imported successfully in less than a second. [Import](#)
- [Text snippet 2018-10-11 16:25:44.755](#)

A purple callout box on the right side of the screen contains the text:

Aggiungiamo le informazioni al grafo <http://example.org/> senza cancellare le triple aggiunte in precedenza

Calcolo incrementale dell'RDF Rank

The screenshot shows the GraphDB Workbench interface for calculating RDF Rank. The left sidebar is titled 'RDF Rank' and contains the following items:

- Import
- Explore
- SPARQL
- Monitor
- Setup
- Repositories
- Users and Access
- My Settings
- Connectors
- Namespaces
- Autocomplete
- RDF Rank
- Help

The 'RDF Rank' item is highlighted with a red background. The main content area is titled 'RDF Rank' and displays the message: 'RDFRank for repository Test is with status ⚠️ Outdated'. Below this are two buttons: 'Compute Full' and 'Compute Incremental'. A large black hand cursor is pointing at the 'Compute Incremental' button. The 'Filtering' section includes a toggle switch set to 'ON' and two checkboxes: 'Include Explicit' (YES) and 'Include Implicit' (YES). It also features tabs for 'Graphs' and 'Predicates', with 'Graphs' selected. Under 'Included', there is a text input field containing 'http://example.org/' with a clear button 'X' next to it, and a placeholder 'Add Included Graphs'. Under 'Excluded', there is a placeholder 'Add Excluded Graphs'.

Explore – Class Relationships - Aggiornamento

The screenshot shows the GraphDB Explore interface running in a browser window at `localhost:7200/relationships`. The left sidebar menu is visible, with the 'Class relationships' option highlighted in red. A tooltip on the 'Explore' icon indicates it's currently selected. A warning message in the center states: 'The currently selected repository contains no dependencies data. Please, reload the diagram if you have imported data recently.' A hand cursor is hovering over the 'Reload Diagram' button, which has a red circular arrow icon above it.

Explore – Class Relationships (1/2)

GraphDB FREE

- [Import](#)
- [Explore](#)
- [Graphs overview](#)
- [Class hierarchy](#)
- [Class relationships](#)
- [Visual graph](#)
- [Similarity](#)
- [SPARQL](#)

Class relationships i

Showing the dependencies between 3 classes

All Incoming Outgoing

Class	Links
foaf:Person	41
foaf:Document	20
foaf:Group	5

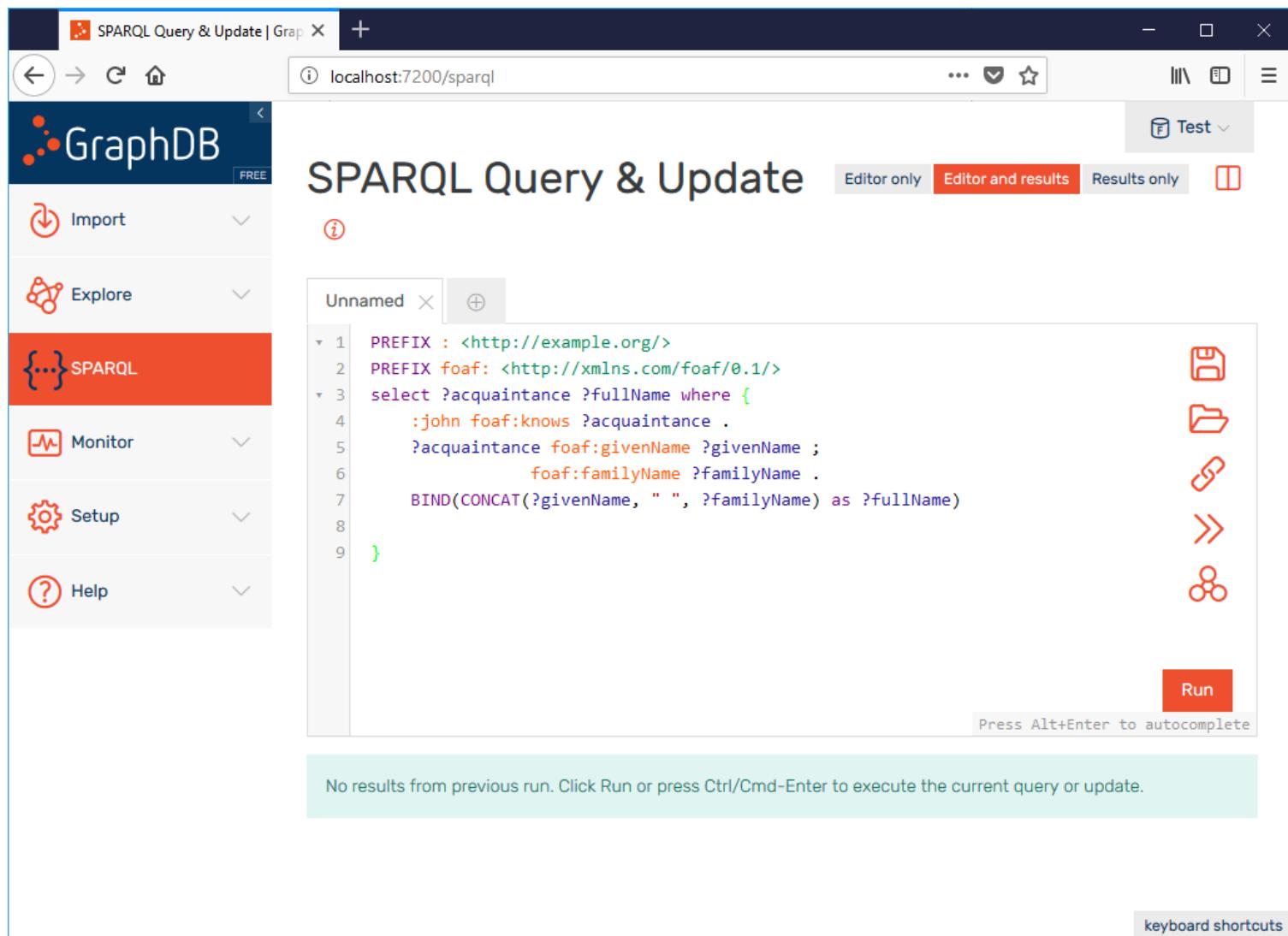
X ↻ Q

Ogni **fascio** rappresenta un gruppo di collegamenti tra due classi.
 L'**ampiezza del fascio** indica il **numero di link**.
 Il **colore del fascio** è quello della classe con più link entranti.

Explore – Class Relationships (2/2)

Il diagramma *class relationships* visualizza ed aiuta a comprendere le relazioni tra le classi come sono determinate da collegamenti effettivi tra le loro istanze.

Query SPARQL (1/6)



The screenshot shows the GraphDB SPARQL Query & Update interface. The left sidebar has a red 'SPARQL' tab selected. The main area displays a SPARQL query:

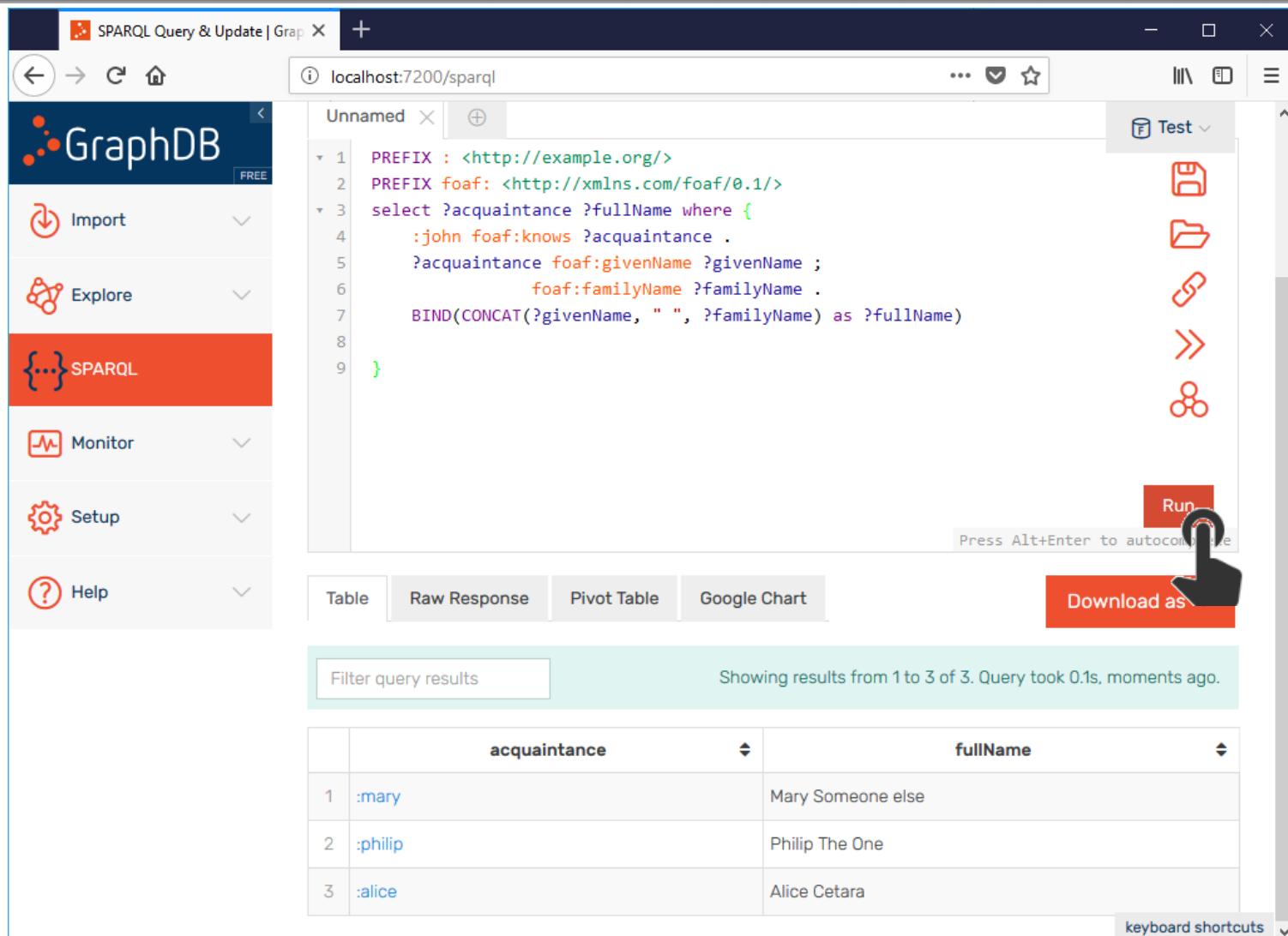
```

1 PREFIX : <http://example.org/>
2 PREFIX foaf: <http://xmlns.com/foaf/0.1/>
3 select ?acquaintance ?fullName where {
4   :john foaf:knows ?acquaintance .
5   ?acquaintance foaf:givenName ?givenName ;
6     foaf:familyName ?familyName .
7   BIND(CONCAT(?givenName, " ", ?familyName) as ?fullName)
8
9 }

```

Below the query, a message says: "No results from previous run. Click Run or press Ctrl/Cmd-Enter to execute the current query or update." A red 'Run' button is visible at the bottom right of the query editor.

Query SPARQL (2/6)



The screenshot shows the GraphDB SPARQL Query & Update interface. On the left is a sidebar with options: Import, Explore, SPARQL (which is selected and highlighted in orange), Monitor, Setup, and Help. The main area has a title bar "SPARQL Query & Update | GraphDB" and a URL "localhost:7200/sparql". A code editor window titled "Unnamed" contains the following SPARQL query:

```

1 PREFIX : <http://example.org/>
2 PREFIX foaf: <http://xmlns.com/foaf/0.1/>
3 select ?acquaintance ?fullName where {
4     :john foaf:knows ?acquaintance .
5     ?acquaintance foaf:givenName ?givenName ;
6         foaf:familyName ?familyName .
7     BIND(CONCAT(?givenName, " ", ?familyName) as ?fullName)
8 }
9

```

To the right of the code editor are several icons: a save icon, a folder icon, a link icon, a copy icon, and a refresh icon. Below these is a red "Run" button with the text "Press Alt+Enter to autocollapse". A hand cursor is hovering over the "Run" button. At the bottom of the code editor are tabs for "Table", "Raw Response", "Pivot Table", and "Google Chart", with "Table" being the active tab.

Below the code editor is a results section with a "Filter query results" input field and a message "Showing results from 1 to 3 of 3. Query took 0.1s, moments ago.". The results are presented in a table:

	acquaintance	fullName
1	:mary	Mary Someone else
2	:philip	Philip The One
3	:alice	Alice Cetara

A "Download as" button is located to the right of the results table. At the bottom right of the interface is a "keyboard shortcuts" dropdown menu.

Query SPARQL (3/6)

The screenshot shows the GraphDB SPARQL Query & Update interface. On the left, there's a sidebar with options: Import, Explore, SPARQL (selected), Monitor, Setup, and Help. The main area has a title bar "SPARQL Query & Update | GraphDB" and a URL "localhost:7200/sparql". A code editor window displays the following SPARQL query:

```

PREFIX : <http://example.org/>
SELECT ?type {
    :john a ?type .
}
  
```

A purple box highlights the text "Inferenza attivata" (Inference activated) near the top right. Below the code editor are tabs: Table, Raw Response, Pivot Table, Google Chart, and a red "Run" button. The results are displayed in a table:

	type
1	foaf:Agent
2	dcterms:Agent
3	foaf:Person
4	http://www.w3.org/2000/10/swap/pim/contact#Person
5	wgs:SpatialThing

Below the table, a message says "Showing results from 1 to 5 of 5. Query took 0.1s, moments ago." A "Download as" button is also present.

Query SPARQL (4/6)

The screenshot shows the GraphDB SPARQL Query & Update interface. On the left, there's a sidebar with options: Import, Explore, SPARQL (which is highlighted in orange), Monitor, Setup, and Help. The main area has a title bar with 'localhost:7200/sparql' and a toolbar with icons for back, forward, search, and refresh. A modal window titled 'Inferenza disattivata' (Inference disabled) is overlaid on the interface. The SPARQL query editor contains the following code:

```

PREFIX : <http://example.org/>
SELECT ?type {
    :john a ?type .
}

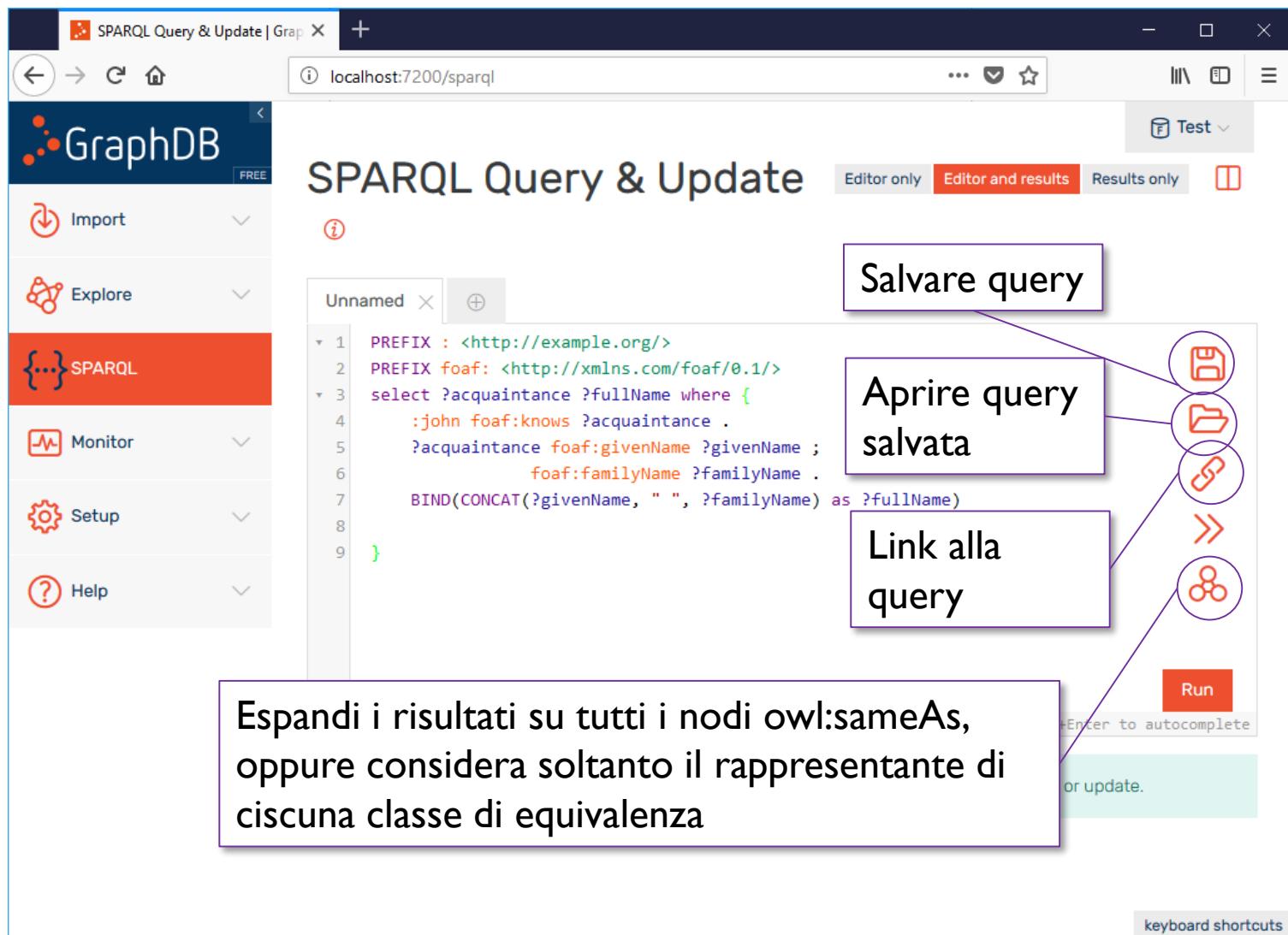
```

Below the query editor are buttons for Save, Open, Copy, Paste, Run, and Download as. The results section shows a table with one row:

	type
1	foaf:Person

At the bottom right, there's a 'keyboard shortcuts' dropdown.

Query SPARQL (5/6)



The screenshot shows the GraphDB SPARQL Query & Update interface. On the left is a sidebar with options: Import, Explore, SPARQL (highlighted in orange), Monitor, Setup, and Help. The main area is titled "SPARQL Query & Update" and shows a query editor with the following code:

```

1 PREFIX : <http://example.org/>
2 PREFIX foaf: <http://xmlns.com/foaf/0.1/>
3 select ?acquaintance ?fullName where {
4     :john foaf:knows ?acquaintance .
5     ?acquaintance foaf:givenName ?givenName ;
6         foaf:familyName ?familyName .
7     BIND(CONCAT(?givenName, " ", ?familyName) as ?fullName)
8 }
9

```

Annotations are overlaid on the interface:

- Salvare query** (Save query) points to the save icon (floppy disk) in the toolbar.
- Aprire query salvata** (Open saved query) points to the open folder icon in the toolbar.
- Link alla query** (Link to query) points to the link icon in the toolbar.
- Espandi i risultati su tutti i nodi owl:sameAs, oppure considera soltanto il rappresentante di ciascuna classe di equivalenza** (Expand results across all nodes owl:sameAs, or consider only the representative of each equivalence class) is a callout pointing to the "Run" button.

Query SPARQL (6/6)

The screenshot shows the GraphDB SPARQL Query & Update interface. At the top, there is a browser-like header with the URL `localhost:7200/sparql`. Below it, a toolbar includes icons for back, forward, search, and refresh. A dropdown menu shows 'PREFIX : <http://example.org/>' and a query editor with the following SPARQL code:

```
PREFIX : <http://example.org/>
SELECT ?type {
```

Below the header is a title bar 'GraphDB' with a logo. The main area is titled 'Editor grafici'. It has tabs for 'Inizio', 'Grafici' (which is selected), 'Personalizza', and 'Nome grafico'. On the left, a sidebar lists chart types: Linea, Area, Colonna, Barra, A dispe..., Torta, Mappa, Tendenza, and Altri. In the center, there are three examples of charts: a dual gauge chart, a treemap chart labeled 'Pets' with 'Cats' and 'Dogs' nodes, and a heatmap table with columns A, B, C, D and rows 14, 25, 36, 47, 25, 36, 47, 58, 36, 47, 58, 69.

A text input field on the right is labeled 'type' and contains 'foaf:Person'. A callout box with a purple border and white background contains the text:

È possibile usare Google Chart per visualizzare i risultati di una query usando vari tipi di grafici e mappe

Reasoning (1/2)

GraphDB implementa il reasoning usando la strategia di **materializzazione completa**:

Applica iterativamente tutte le regole definite nel ruleset selezionato finché non riesce più ad inferire nuove triple.

Il costo del reasoning viene trasferito sulle transazioni in scrittura (poiché tutto il processo di inferenza viene eseguito dopo le modifiche), mentre le transazioni in lettura sono avvantaggiate (poiché le triple inferite si trovano già pronte negli indici)

Reasoning (2/2)

La semantica sottostante è **monotona**.

L'**aggiunta di una tripla** non può invalidare inferenze precedenti, ma soltanto permetterne di nuove:

è sufficiente proseguire con nuove iterazioni del processo di inferenza (partendo dalle regole attivate dalla nuova tripla)

La **rimozione di una tripla** può invalidare inferenze precedenti, ed una tripla inferita deve essere rimossa se non esiste nessun altro modo per derivarla senza usare la tripla rimossa:

La soluzione naïve consiste nel riavviare il processo di reasoning da zero, ma ciò significa che il costo di una rimozione sarà sempre maggiore man mano che la taglia del repository cresce. GraphDB supporta anche qui un approccio incrementale: i) cerca in forward-chaining le triple che si possono inferire dalla tripla che è stata rimossa, ii) poi cerca in backward-chaining derivazioni per queste triple che non usano la tripla cancellata

Ottimizzazione di owl:sameAs

Nella semantica di OWL **owl:sameAs** è una proprietà riflessiva, simmetrica e transitiva, cioè una **relazione di equivalenza**.

Ciò significa che se ho N risorse *sameAs* tra di loro, avrò N^2 *sameAs* ed ogni statement che coinvolge ciascuna risorsa viene ripetuto per tutte le altre.

GraphDB offre una implementazione non rule-based di *owl:sameAs*, per cui questi gruppi di risorse sono rappresentati esplicitamente come classi di equivalenza, ciascuna dotata di un rappresentante che viene usato come identificatore della classe, e per rappresentare in maniera più compatta tutti gli statement che coinvolgono i membri della classe.

GEOSPARQL & Full text search

GraphDB supporta query geospaziali e fulltext search, (usando opportuni indici):

- <http://graphdb.ontotext.com/documentation/free/full-text-search.html>
- <http://graphdb.ontotext.com/documentation/free/geosparql-support.html>

Anche nel caso della fulltext search, è possibile aggiornare gli indici in maniera incrementale dopo cambiamenti dei dati.

OntoRefine

The screenshot shows the OntoRefine interface running in a browser window titled "OntoRefine | GraphDB Worker". The URL is "localhost:7200/ontorefine". The left sidebar has a "Tabular (OntoRefine)" section highlighted in orange, containing options like Import, RDF, Explore, SPARQL, Monitor, Setup, and Help. The main content area is titled "OntoRefine" and shows the "Create Project" step. It explains that projects can be created by importing data in various formats (TSV, CSV, *SV, Excel, JSON, XML, RDF as XML, Google Data). A "Get data from" section allows users to upload files from their computer or clipboard. A red callout box at the bottom right contains the text: "Per importare dati (prevalentemente) in formati tabulari e trasformarli in RDF".

OntoRefine

Create Project

Open Project

Import Project

Get data from

This Computer

Web Addresses (URLs)

Clipboard

Sfoglia... Nessun file selezionato.

Next »

Per importare dati (prevalentemente) in formati tabulari e trasformarli in RDF

References

1. Ontotext GraphDB. <http://graphdb.ontotext.com/>
2. Bishop, B., Kiryakov, A., Ognyanoff, D., Peikov, I., Tashev, Z., & Velkov, R. (2011). [OWLIM: A family of scalable semantic repositories](#). Semantic Web, 2(1), 33-42.