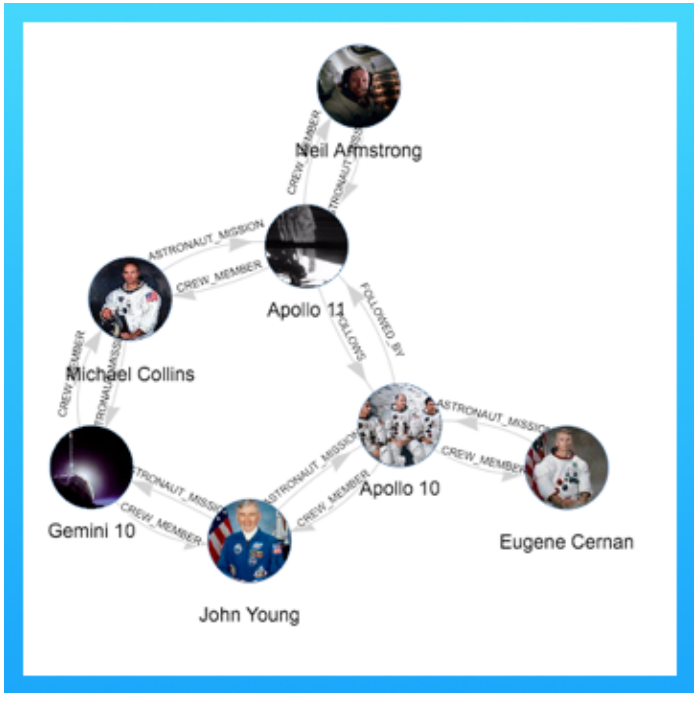
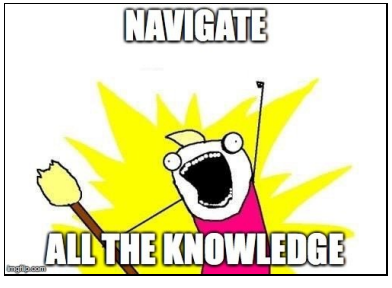
Navigate *All* the Knowledge

Getting started with ConceptMap.io

http://ConceptMap.io



James L. Weaver
Developer Advocate
Pivotal™



Twitter: @JavaFXpert
Email: jweaver@pivotal.io
http://JavaFXpert.com
http://CulturedEar.com

About the Presenter

Author of several Java/JavaFX/RaspPi books

Java Champion, JavaOne Rockstar, plays well with others, etc :-)

@JavaFXpert Pivotal

App is live at ConceptMap.io

ConceptMap.io source code for services and UI:
https://github.com/JavaFXpert/wikibrowser-service

Open source, licensed under the Apache License, Version 2.0

Note: These **Technical Presentation** slides are available at
http://slides.com/javafxpert/conceptmap-technical
as well as by clicking the Help ? button in ConceptMap.io

@JavaFXpert Pivotal

Wikimedia has many projects

Graphic from presentation by Lynda Pintscher

... the most famous is Wikipedia

articles: 23 000 000+

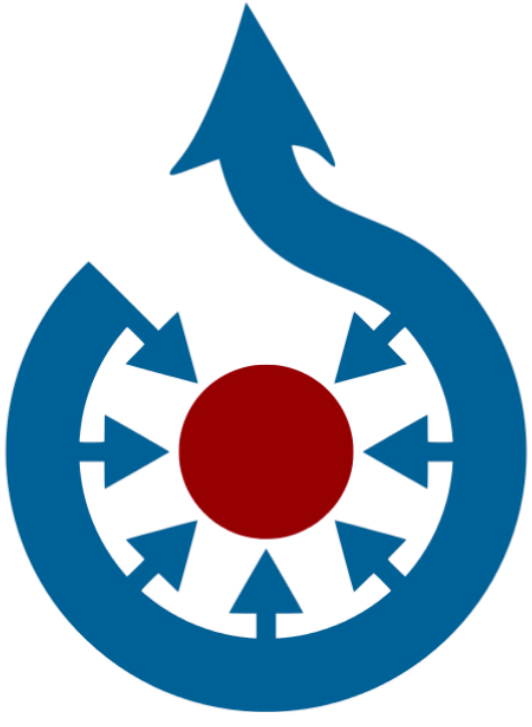
edits: 1 400 000 000+

languages: 286

Graphic from 2013 presentation by Lynda Pintscher

Wikimedia Commons

Media files leveraged by Wikimedia projects



Graphic from 2013 presentation by Lynda Pintscher

@JavaFXpert Pivotal

Wikidata

Central storage for the structured data of Wikimedia projects

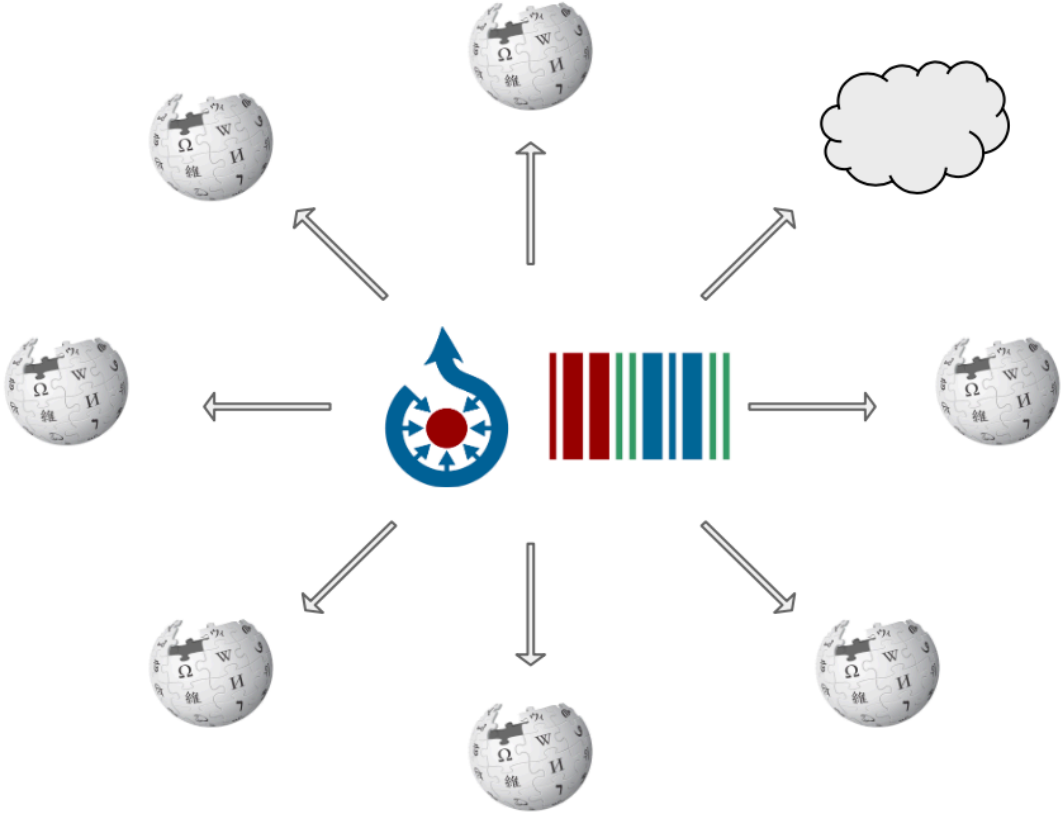
Graphic from 2013 presentation by Lynda Pintscher

@JavaFXpert

Pivotal™

Wikidata

Provides semantic structure for Wikipedia articles in any language



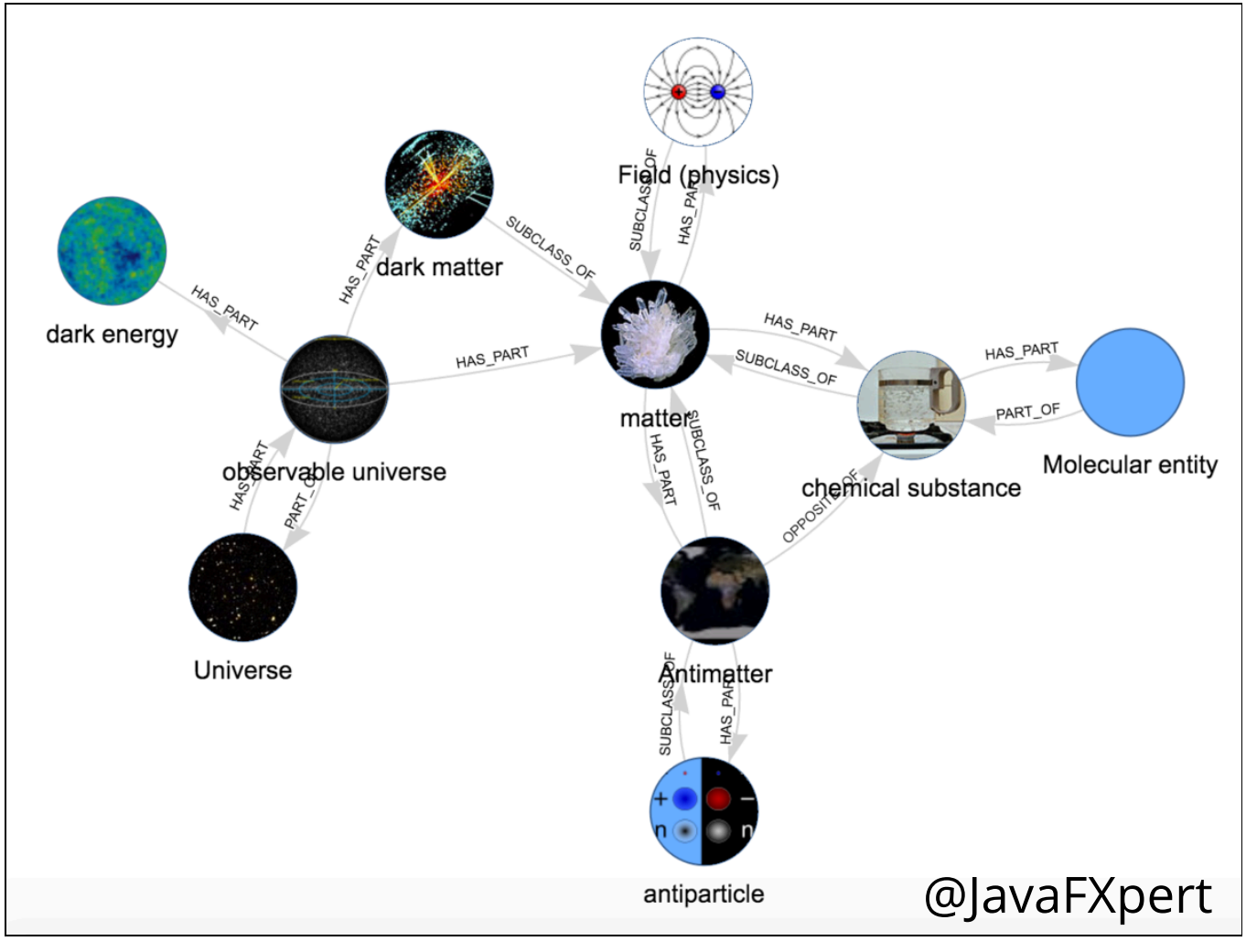
Graphic from 2013 presentation by Lynda Pintscher

@JavaFXpert

Pivotal

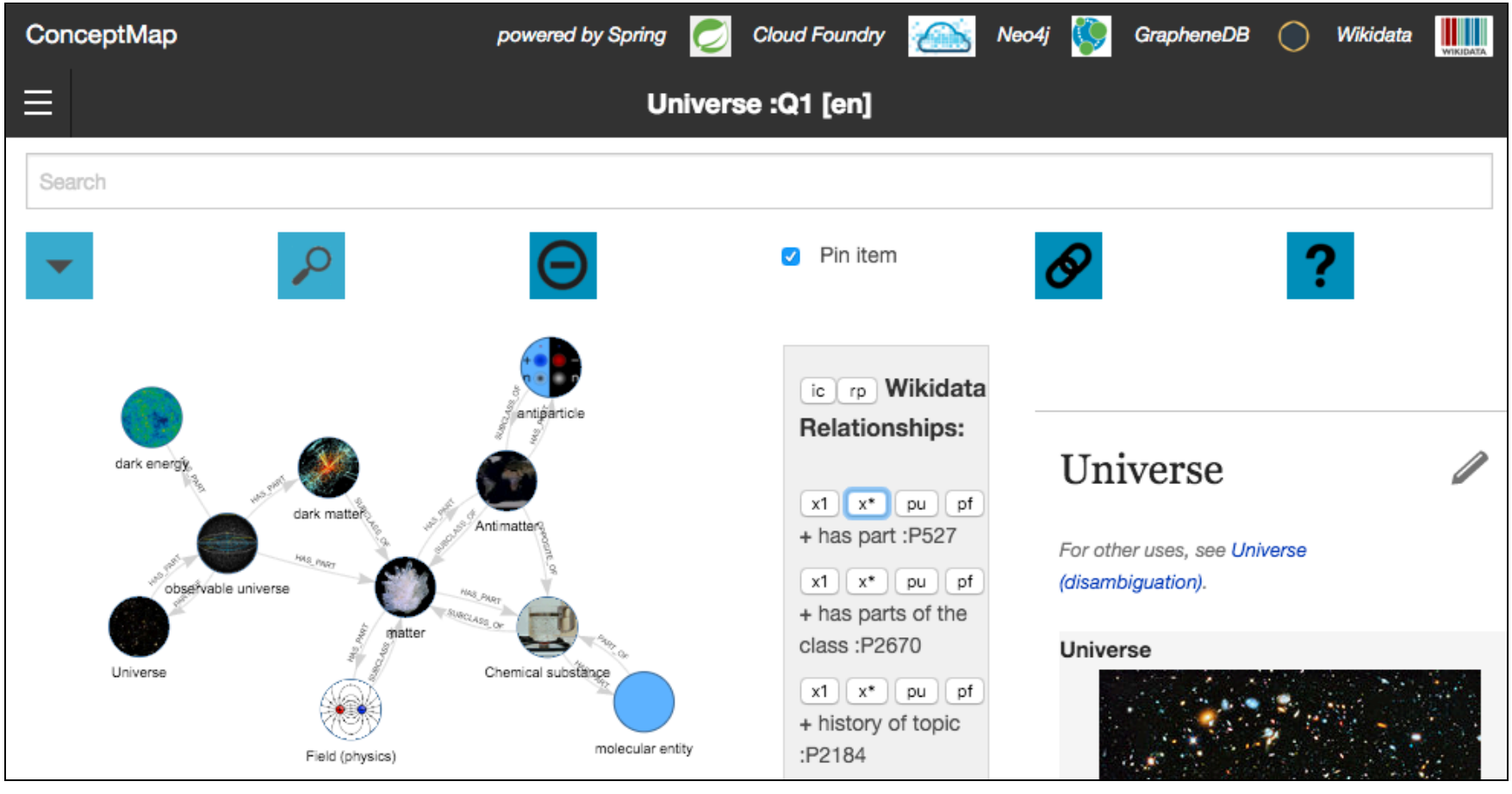
Wikipedia + Wikidata

Wikipedia articles and their relationships to each other



The Big Idea: ConceptMap.io

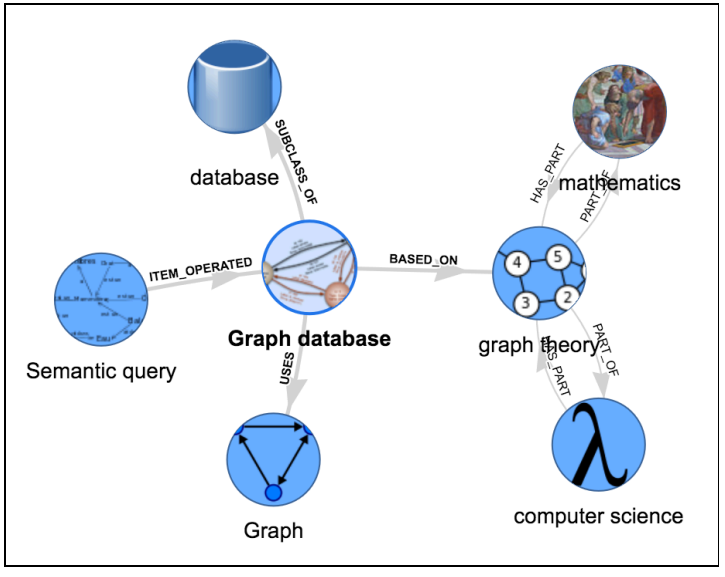
Navigate/pin Wikipedia articles via links and Wikidata relationships

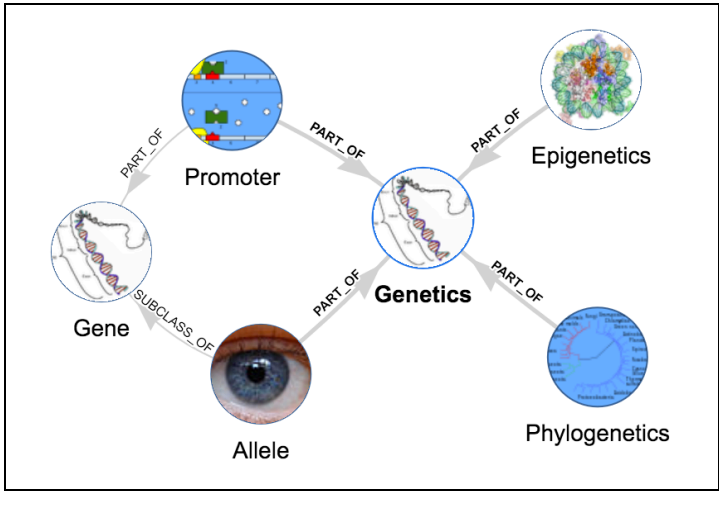


@JavaFXpert

Designed to facilitate:

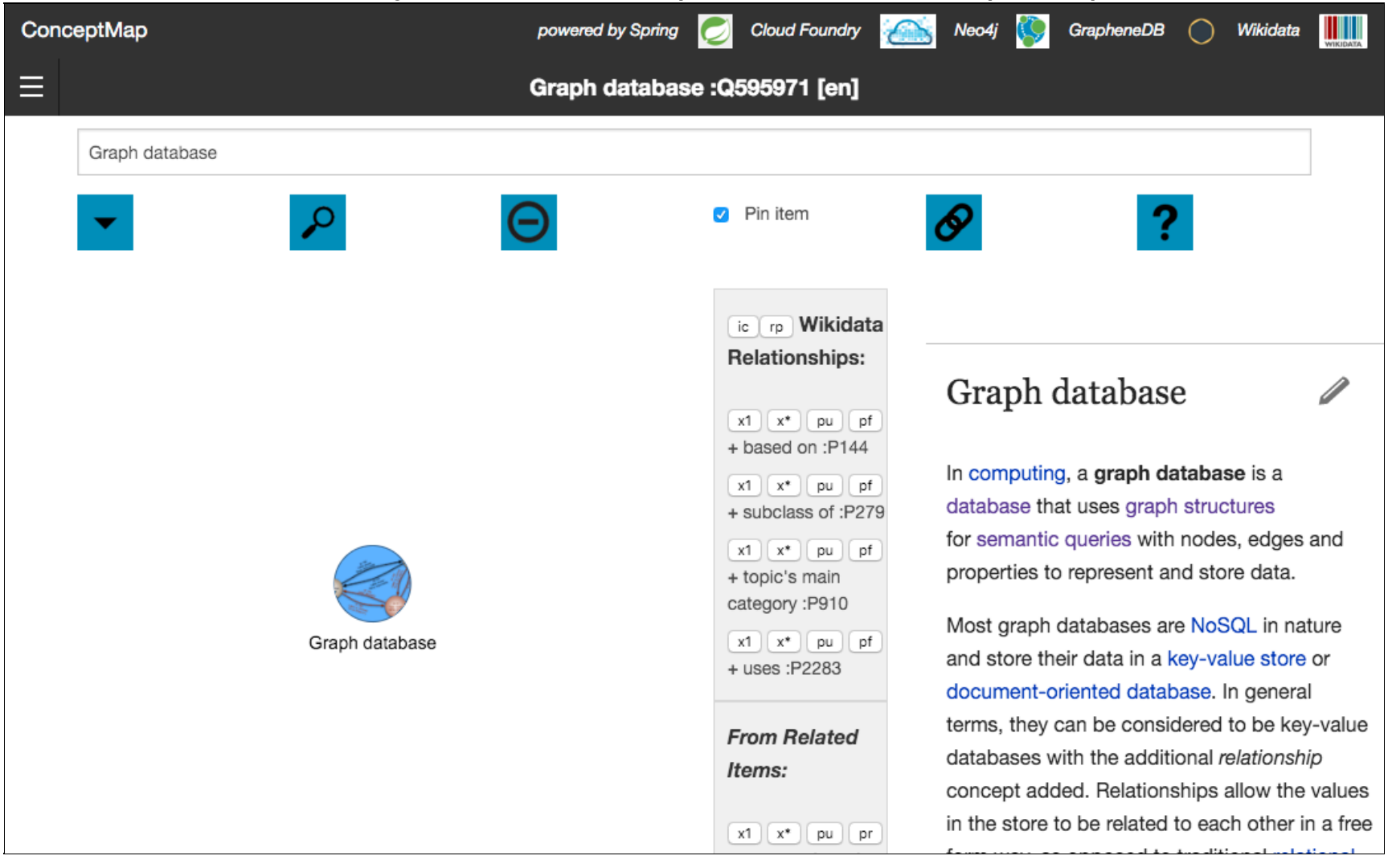
- Learning
- Teaching
- Research





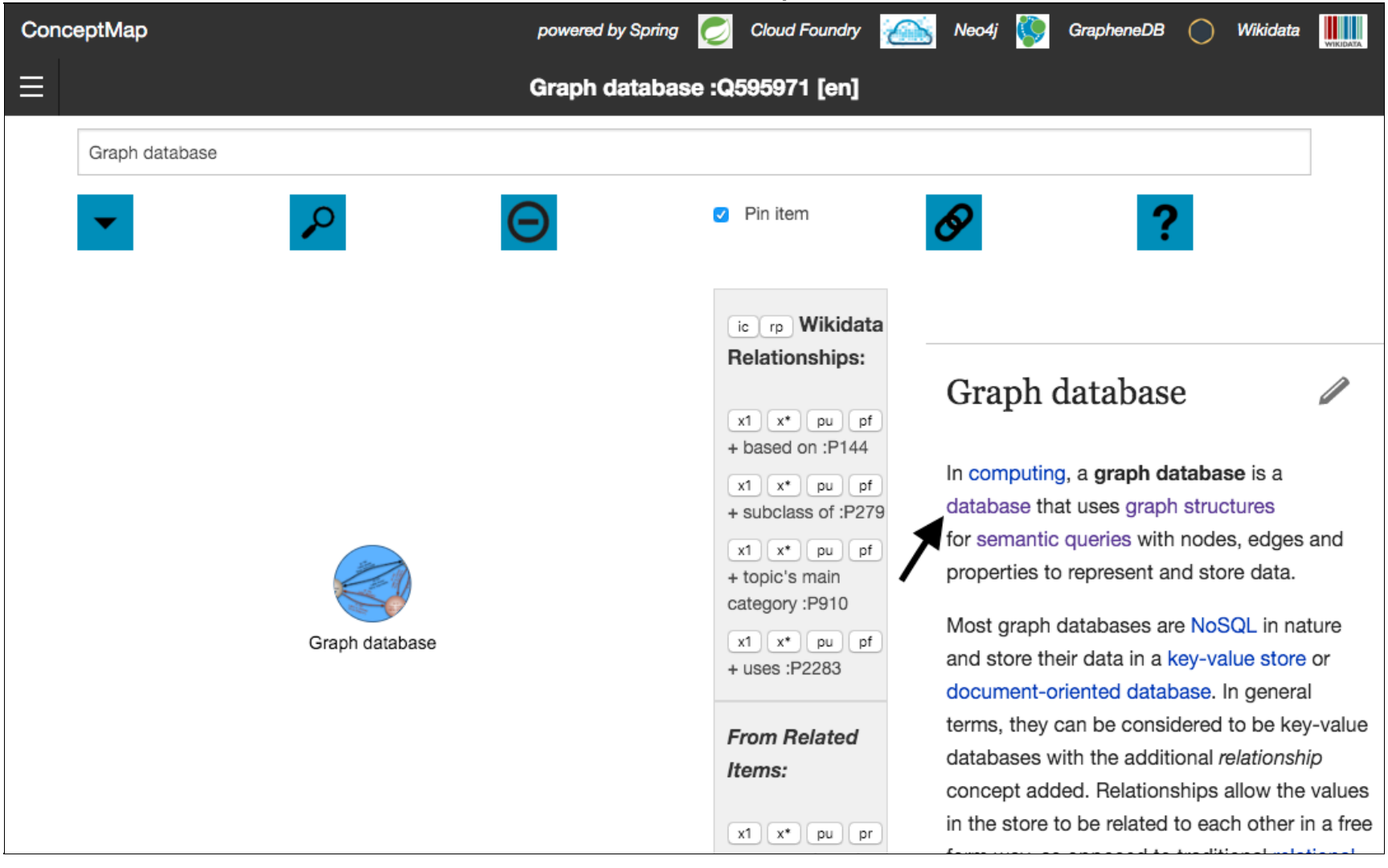
Learning/Teaching Scenario

Search for an item and pin it to the concept map



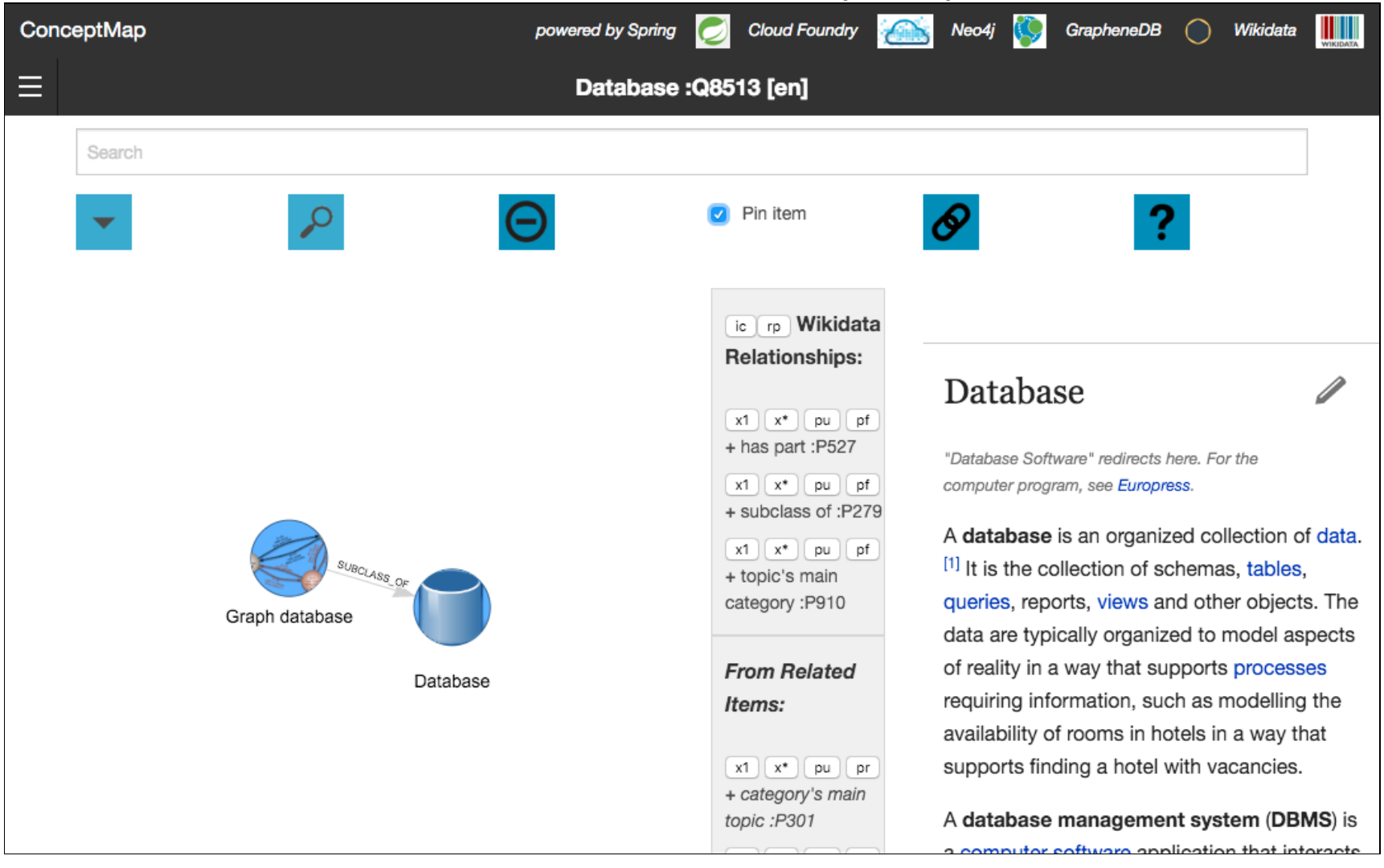
Learning/Teaching Scenario

Select a link in the Wikipedia article



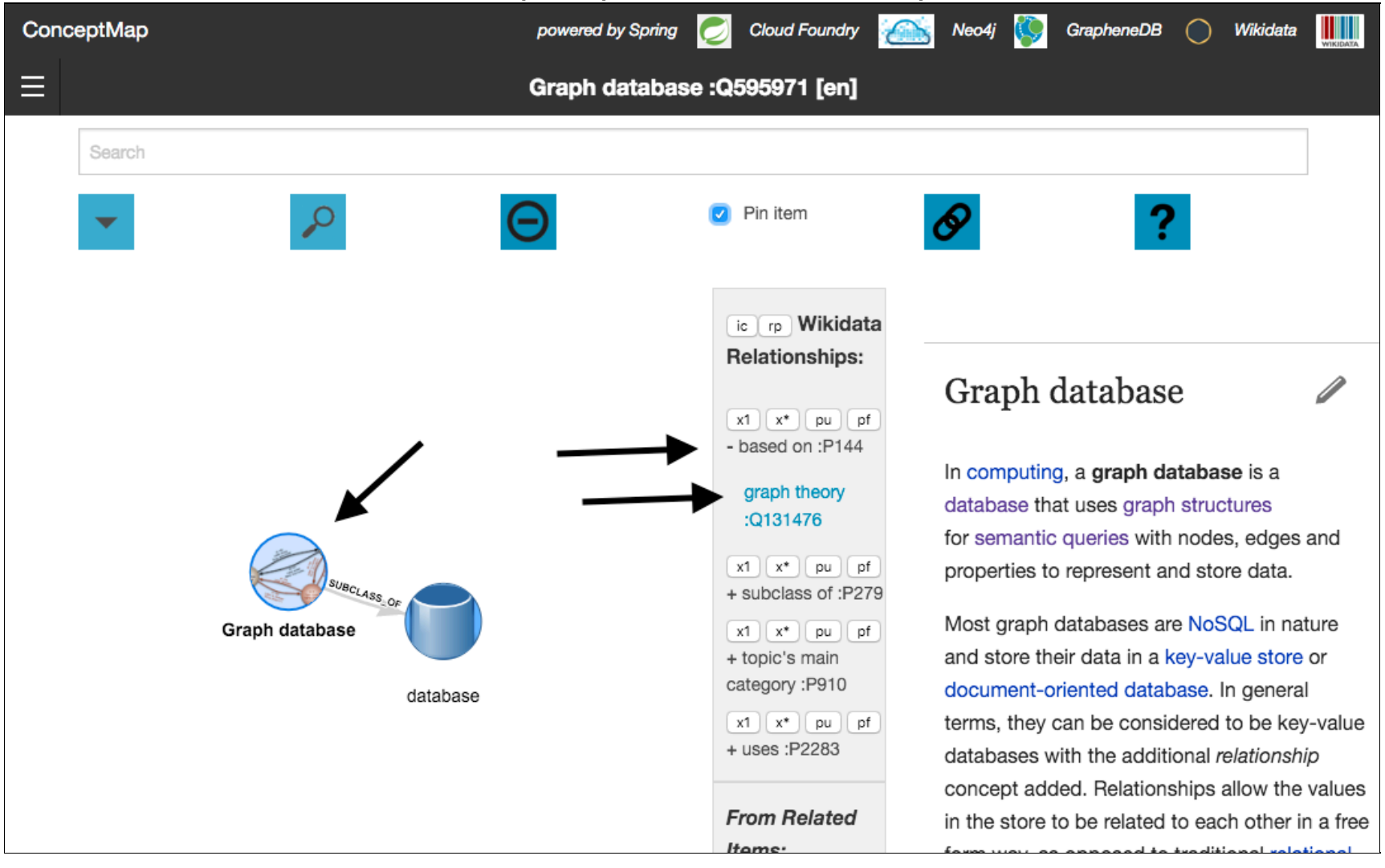
Learning/Teaching Scenario

Pin the item to the concept map



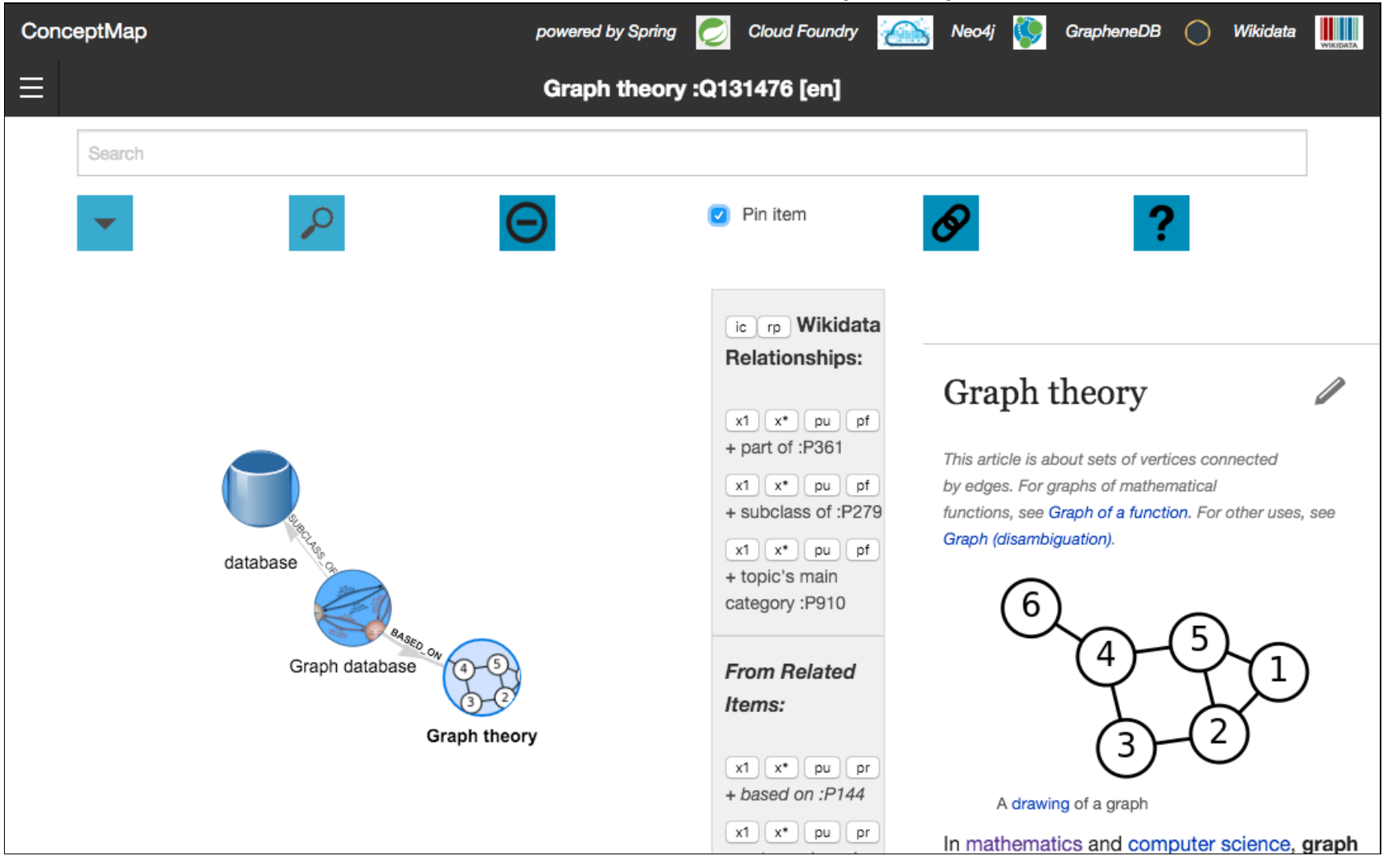
Learning/Teaching Scenario

Select an item in the map, expand a relationship, and select an item



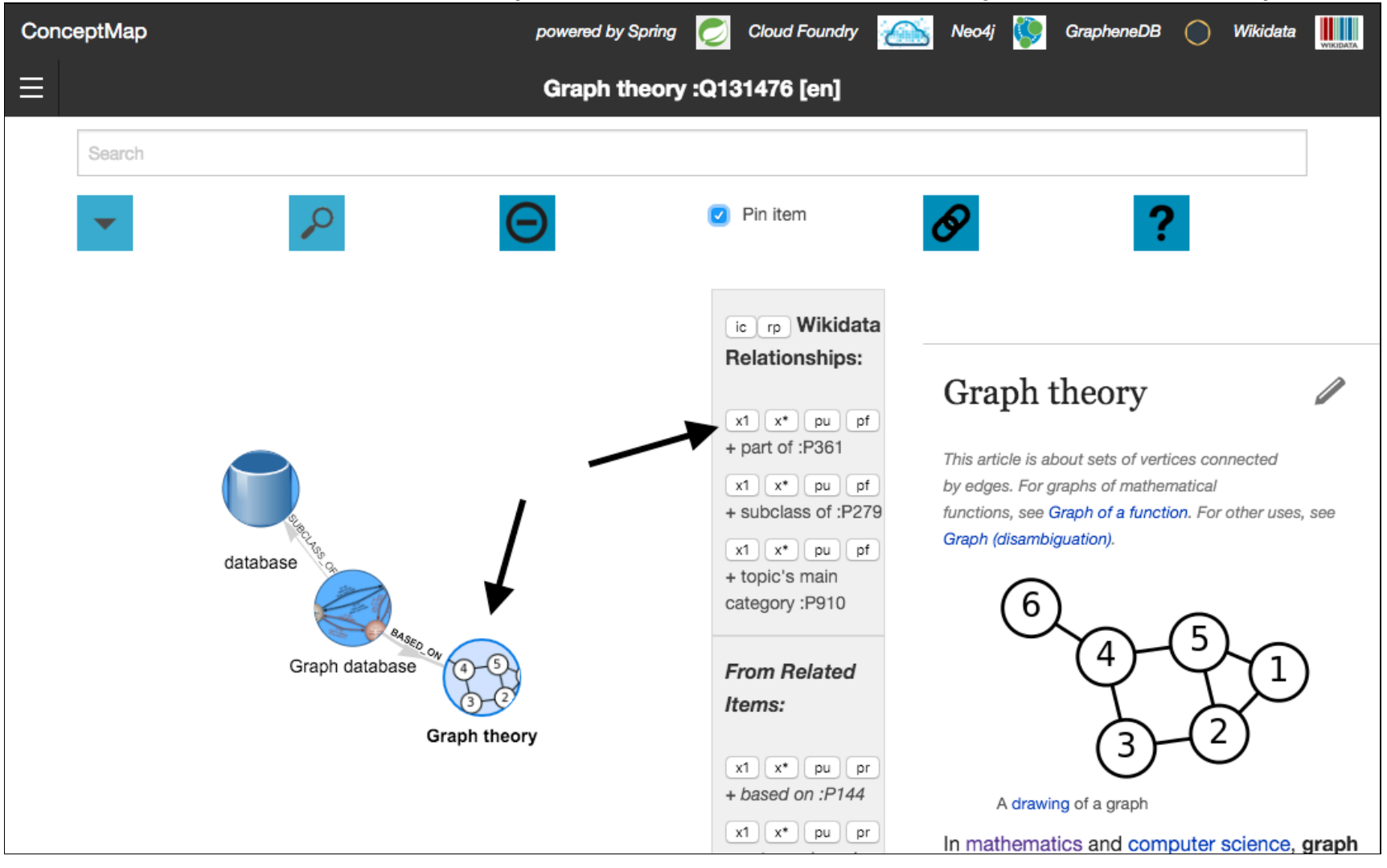
Learning/Teaching Scenario

Pin the item to the concept map



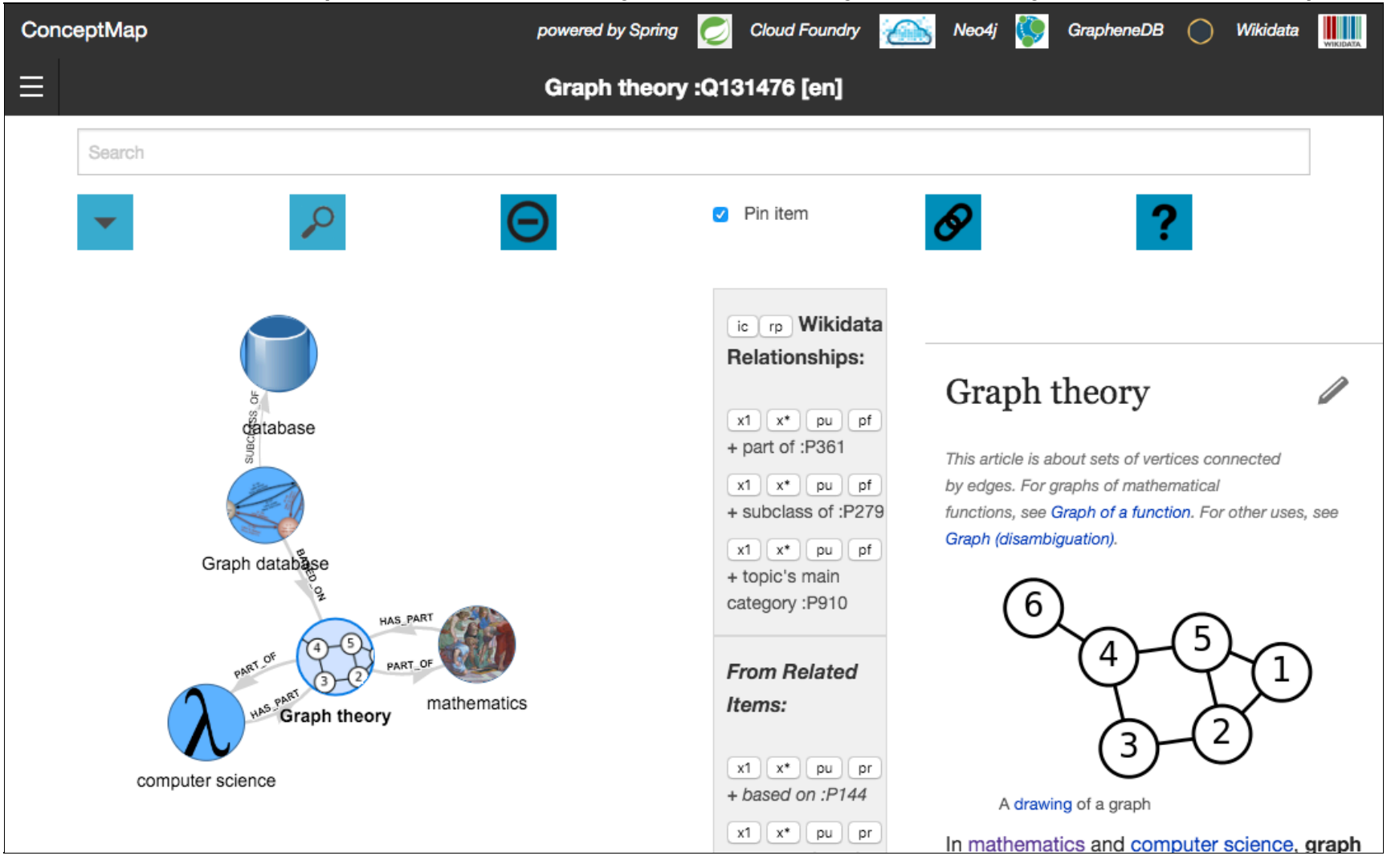
Learning/Teaching Scenario

Select an item in the map, and click the [x1] button for a relationship



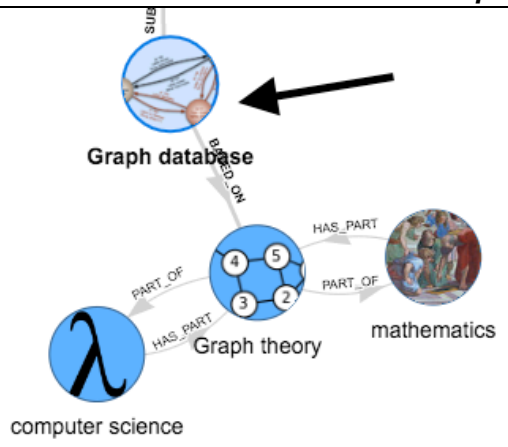
Learning/Teaching Scenario

The [x1] button pinned the items found at the first level of the relationship



Learning/Teaching Scenario

Select an item in the concept map, and select an item From Related Items



x1 x* pu pf
+ topic's main category :P910

x1 x* pu pf
+ uses :P2283

From Related Items:

x1 x* pu pr
+ category's main topic :P301

x1 x* pu pr
- instance of :P31

AllegroGraph :Q4731408

ArangoDB :Q20072115

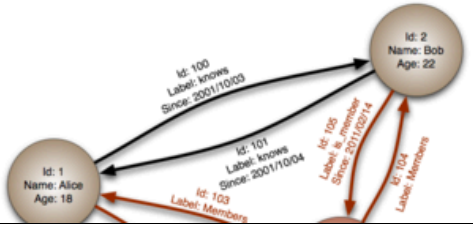
Blazegraph :Q20127748

DEX :Q3817722

Neo4j :Q1628290

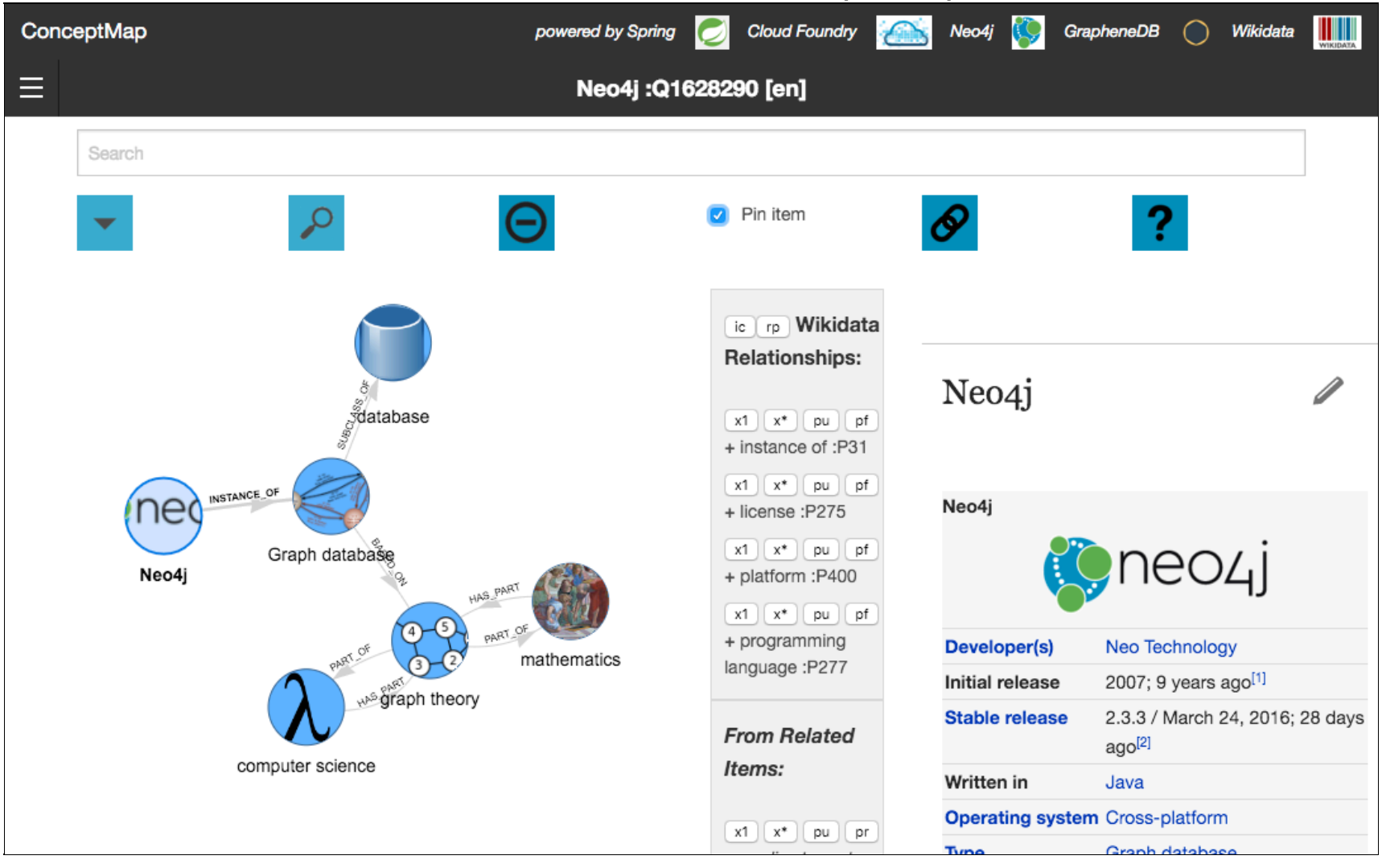
for semantic queries with nodes, edges and properties to represent and store data.

Most graph databases are NoSQL in nature and store their data in a key-value store or document-oriented database. In general terms, they can be considered to be key-value databases with the additional *relationship* concept added. Relationships allow the values in the store to be related to each other in a free form way, as opposed to traditional relational databases where the relationships are defined within the data itself. These relationships allow complex hierarchies to be quickly traversed, addressing one of the more common performance problems found in traditional key-value stores. Most graph databases also add the concept of *tags* or *properties*, which are essentially relationships lacking a pointer to another document.



Learning/Teaching Scenario

Pin the item to the concept map



Learning/Teaching Scenario

Continue selecting items from Wikipedia articles and Wikidata Relationships

computer science

Items:

x1 x* pu pr

+ applies to part :P518

Written in	Java
Operating system	Cross-platform
Type	Graph database
License	Dual-licensed: GPLv3 and AGPLv3 / commercial
Website	neo4j.com

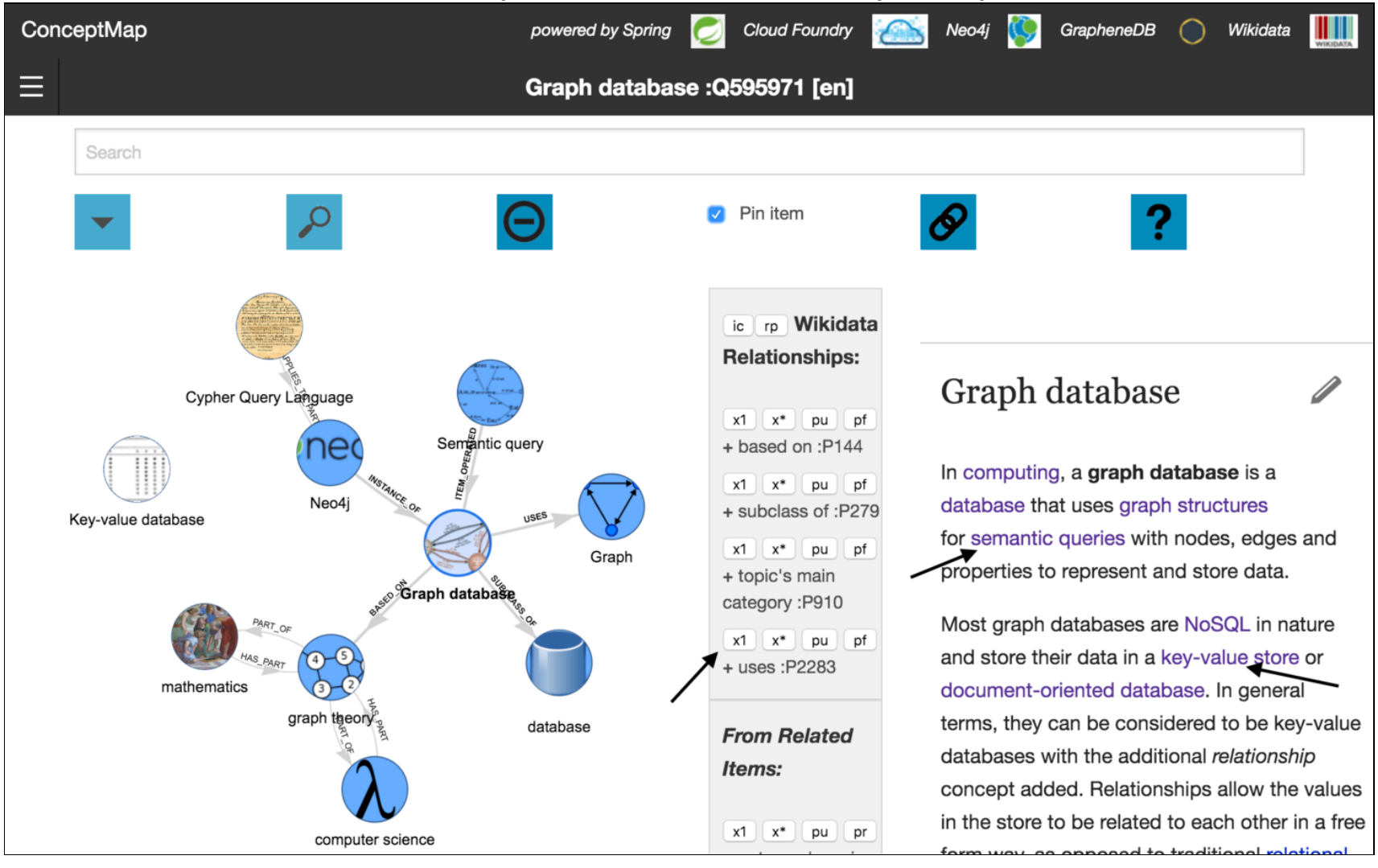
Neo4j is a graph database management system developed by Neo Technology, Inc. Described by its developers as an ACID-compliant transactional database with native graph storage and processing,[3] Neo4j is the most popular graph database according to db-engines.com.[4]

Neo4j is available in a GPL3-licensed open-source "community edition", with online backup and high availability extensions licensed under the terms of the Affero General Public License. Neo also licenses Neo4j with these extensions under closed-source commercial terms.[5]

Neo4j is implemented in Java and accessible from software written in other languages using the Cypher Query Language through a

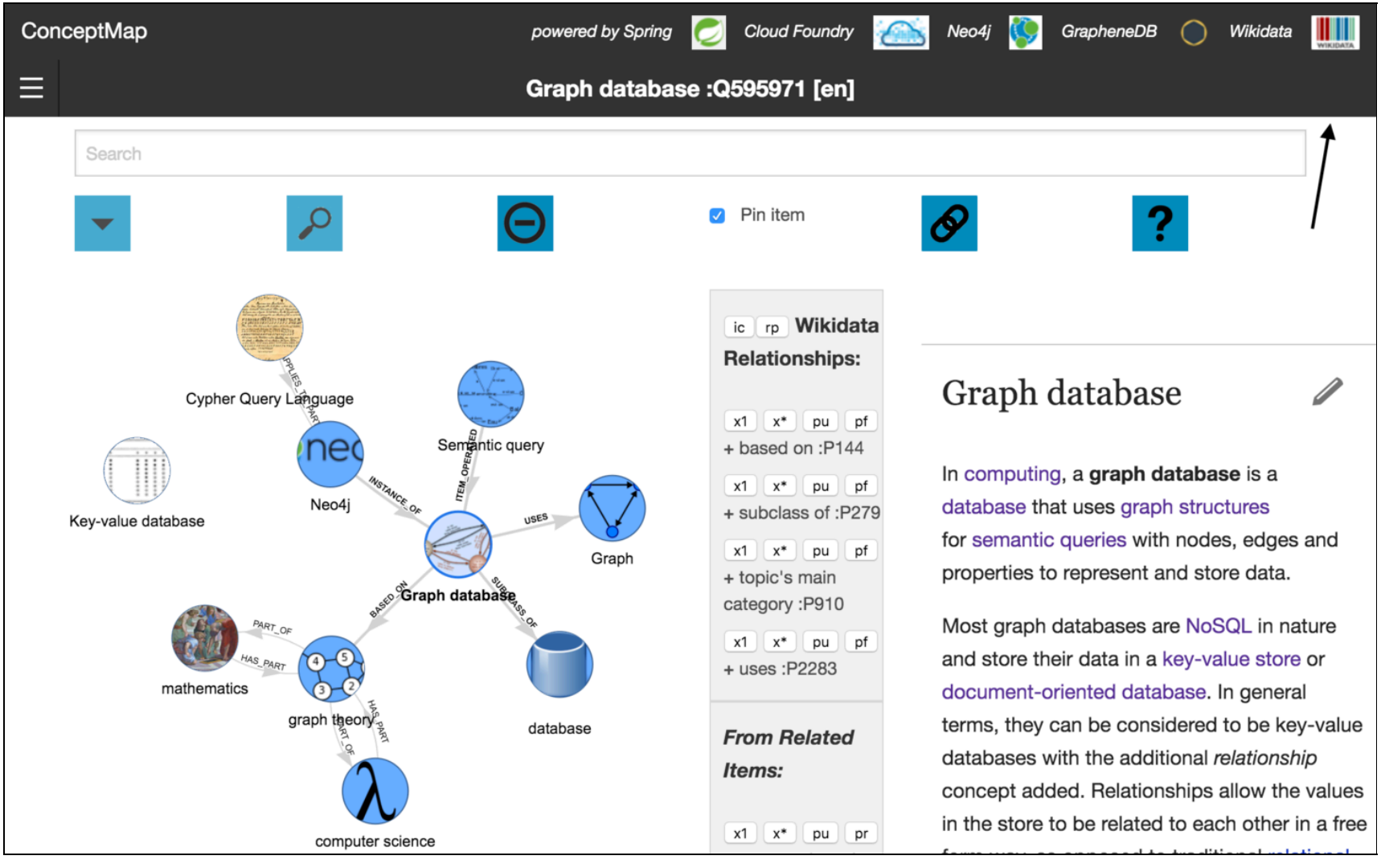
Learning/Teaching Scenario

... and pin them to the concept map



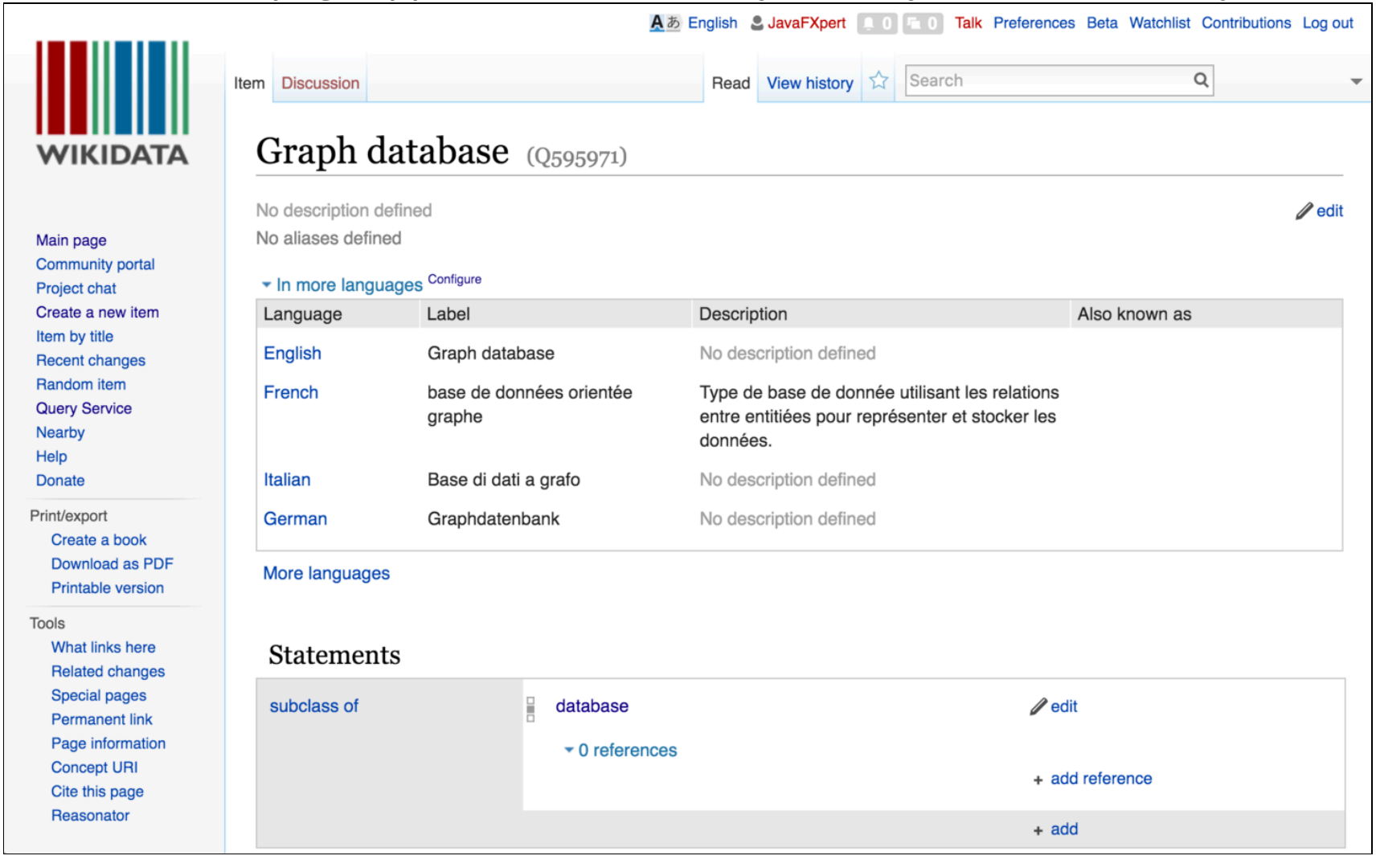
Learning/Teaching Scenario

Edit relationships for an item by selecting Wikidata icon



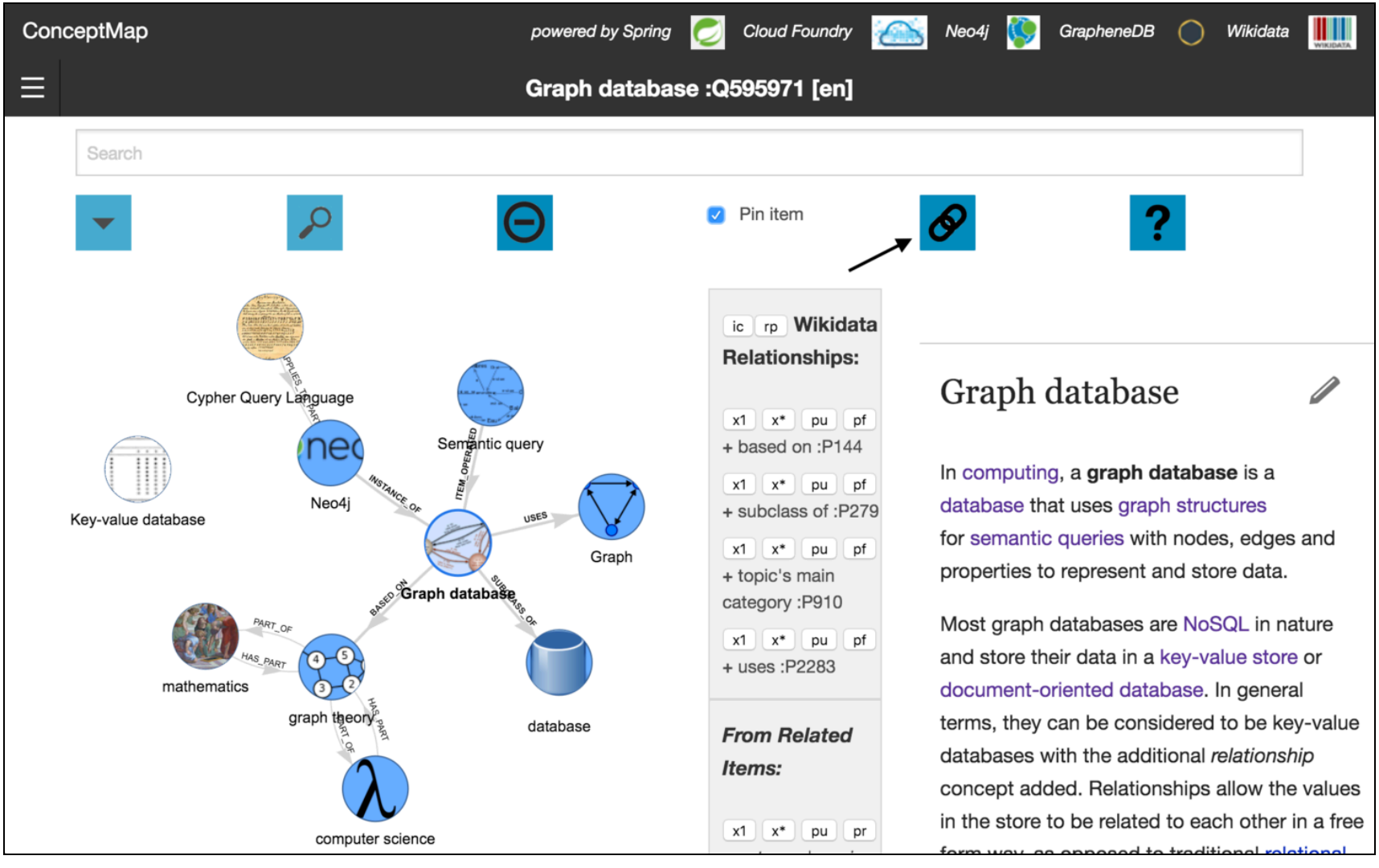
Learning/Teaching Scenario

Wikidata page appears with which anyone may edit the item's info



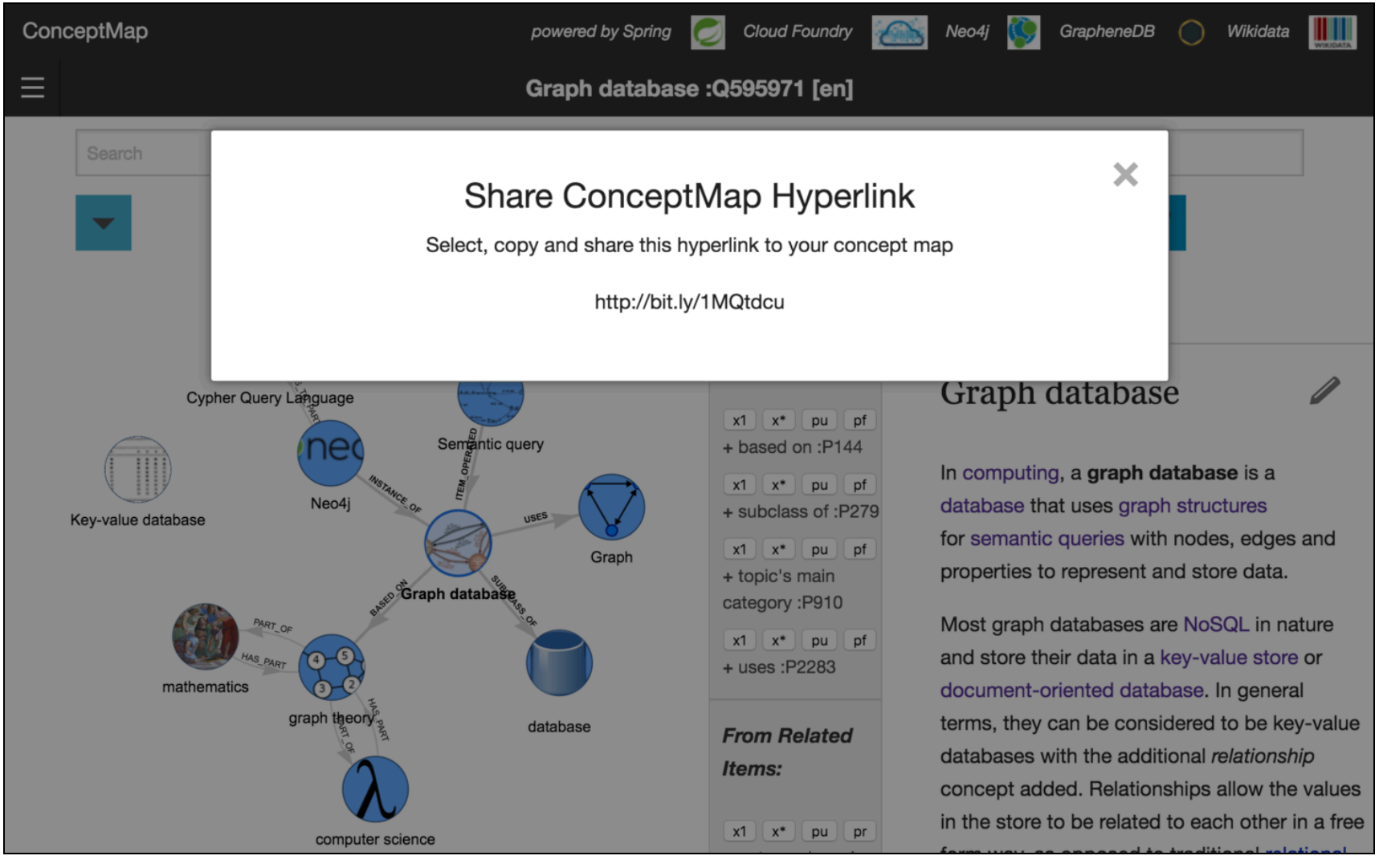
Learning/Teaching Scenario

Select the Link icon to create a link to the concept map



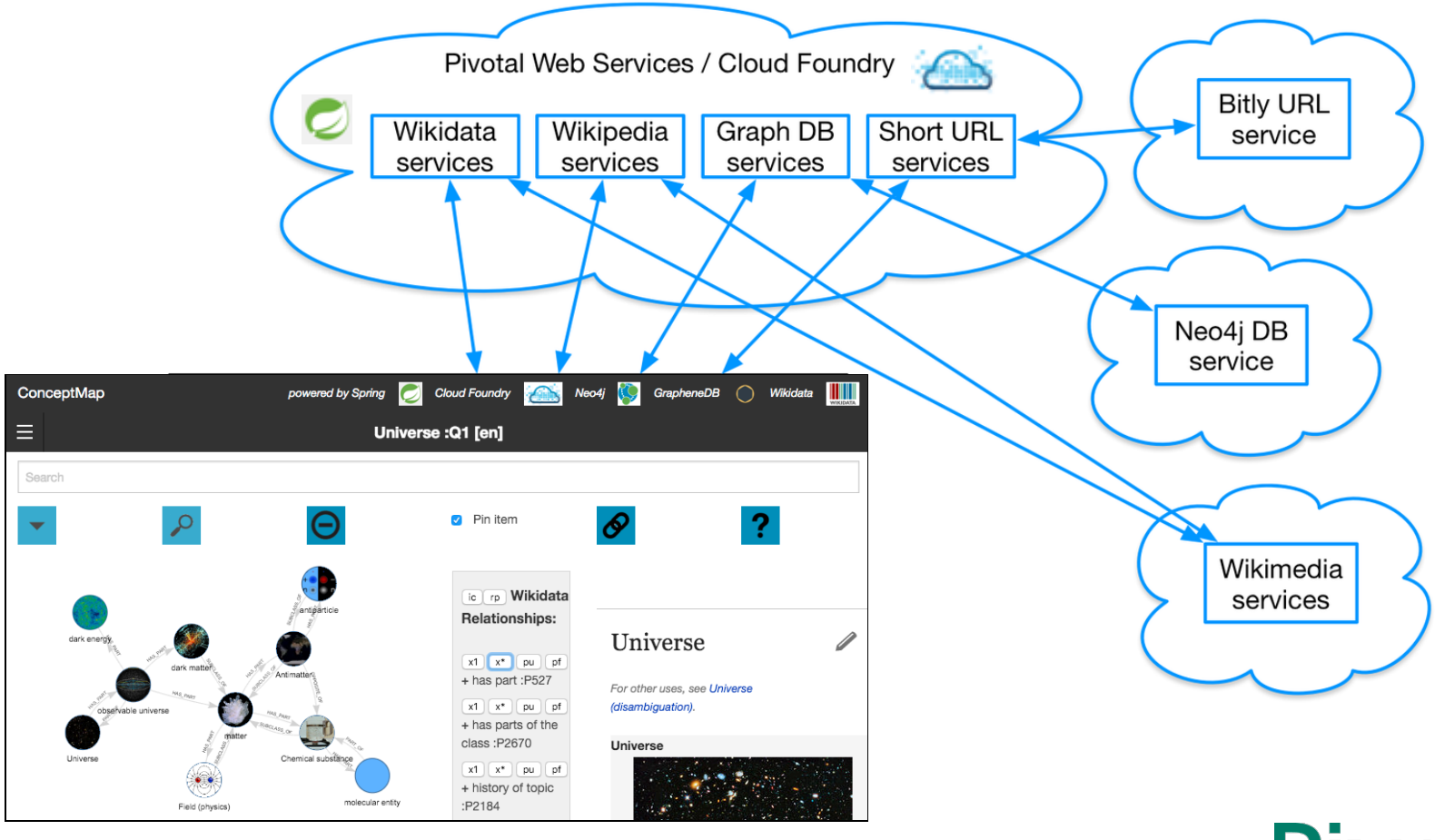
Learning/Teaching Scenario

Share the link to your concept map with a colleague or student



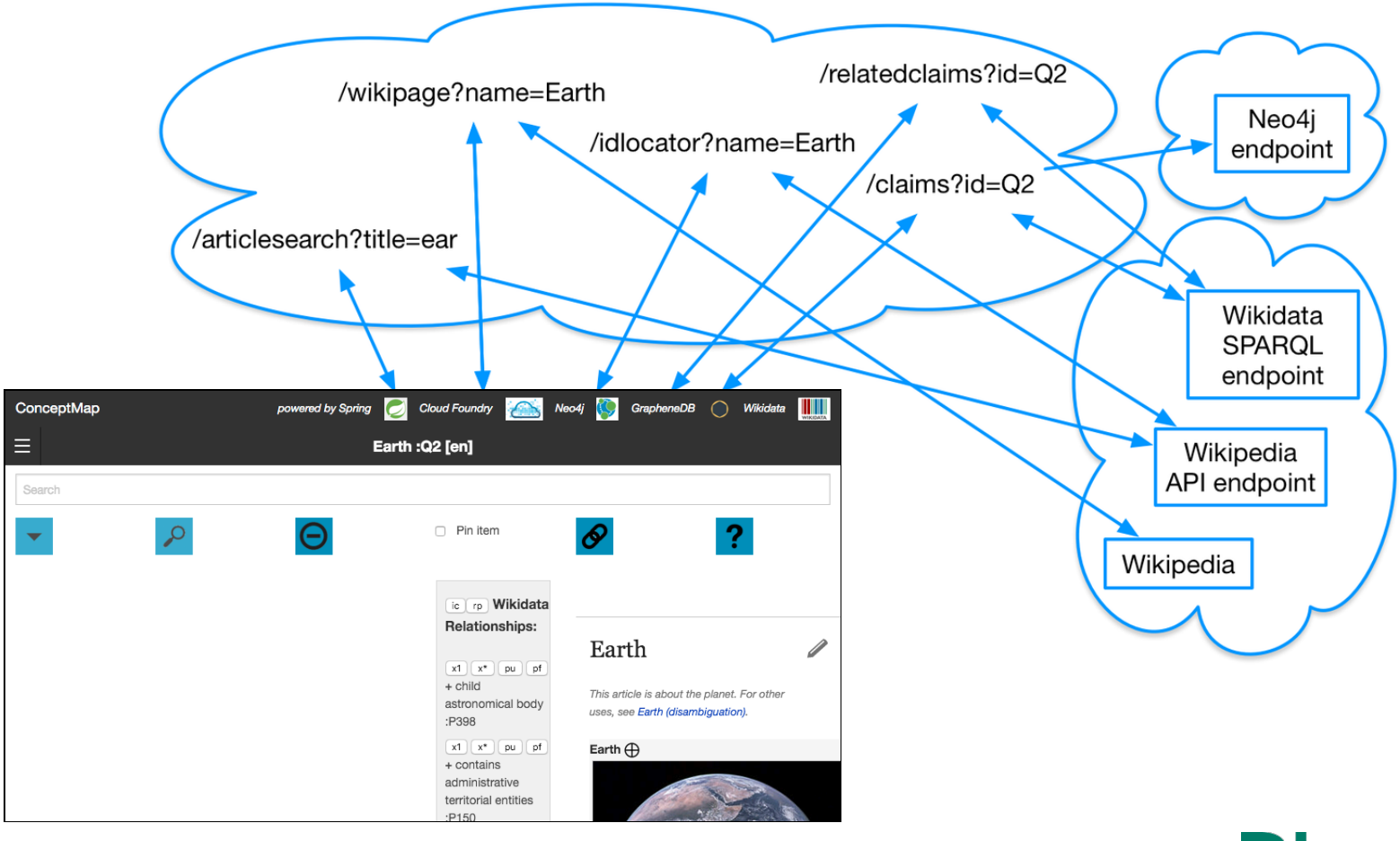
ConceptMap.io

High-level view of distributed architecture



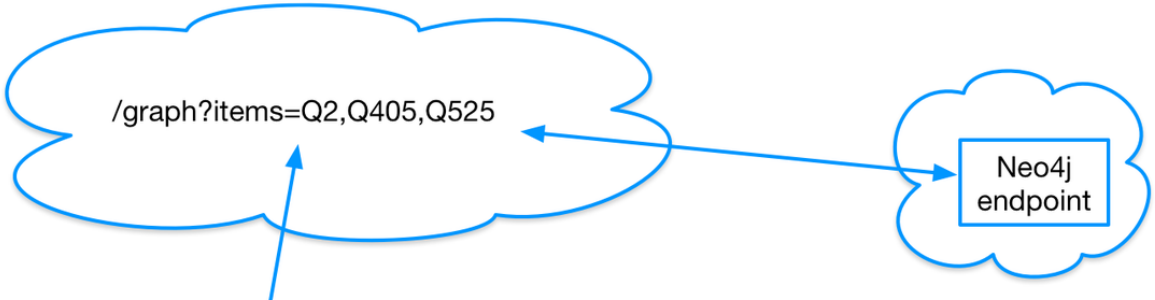
Pivotal™

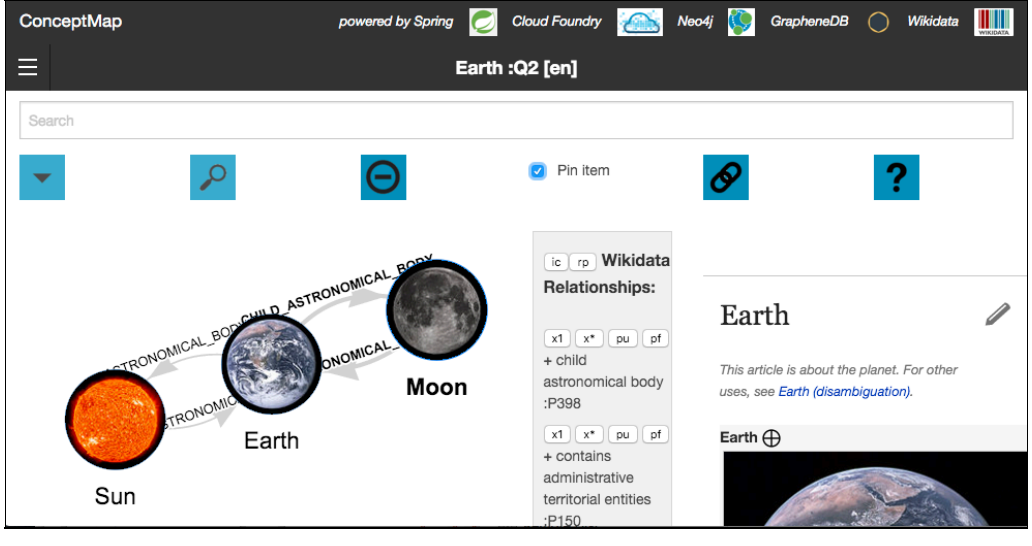
Use case: Search for Earth



Pivotal™

Use case: Pin Earth to graph





Pivotal™

Neo4j Cypher query

(find all relationships between pinned items)

http://example/graph?items=Q2,Q405,Q525

```
MATCH (a:Item), (b:Item)
WHERE a.itemId IN ['Q2', 'Q405', 'Q525']
  AND b.itemId IN ['Q2', 'Q405', 'Q525']
WITH a, b
OPTIONAL MATCH (a)-[rel]-(b)
RETURN a, b, collect(rel)
```

Pivotal™

Resource controller

http://example/visgraph?items=Q2,Q405,Q525

```
@RestController
public class WikiGraphController {
  @RequestMapping(value = "/graph", method = RequestMethod.GET,
                  produces = MediaType.APPLICATION_JSON_VALUE
  public ResponseEntity<Object> search(@RequestParam(value = "items", defaultValue="")
                                       String items) {
    GraphResponseNear graphResponseNear = null;
    ...
    return Optional.ofNullable(graphResponseNear)
        .map(cr -> new ResponseEntity<>((Object)cr, HttpStatus.OK))
        .orElse(new ResponseEntity<>("Graph query unsuccessful",
                                     HttpStatus.INTERNAL_SERVER_ERROR));
  }
}
```

Note: Because Jackson 2 is on the classpath, Spring's MappingJackson2HttpMessageConverter is automatically chosen to convert the GraphResponseNear instance to JSON

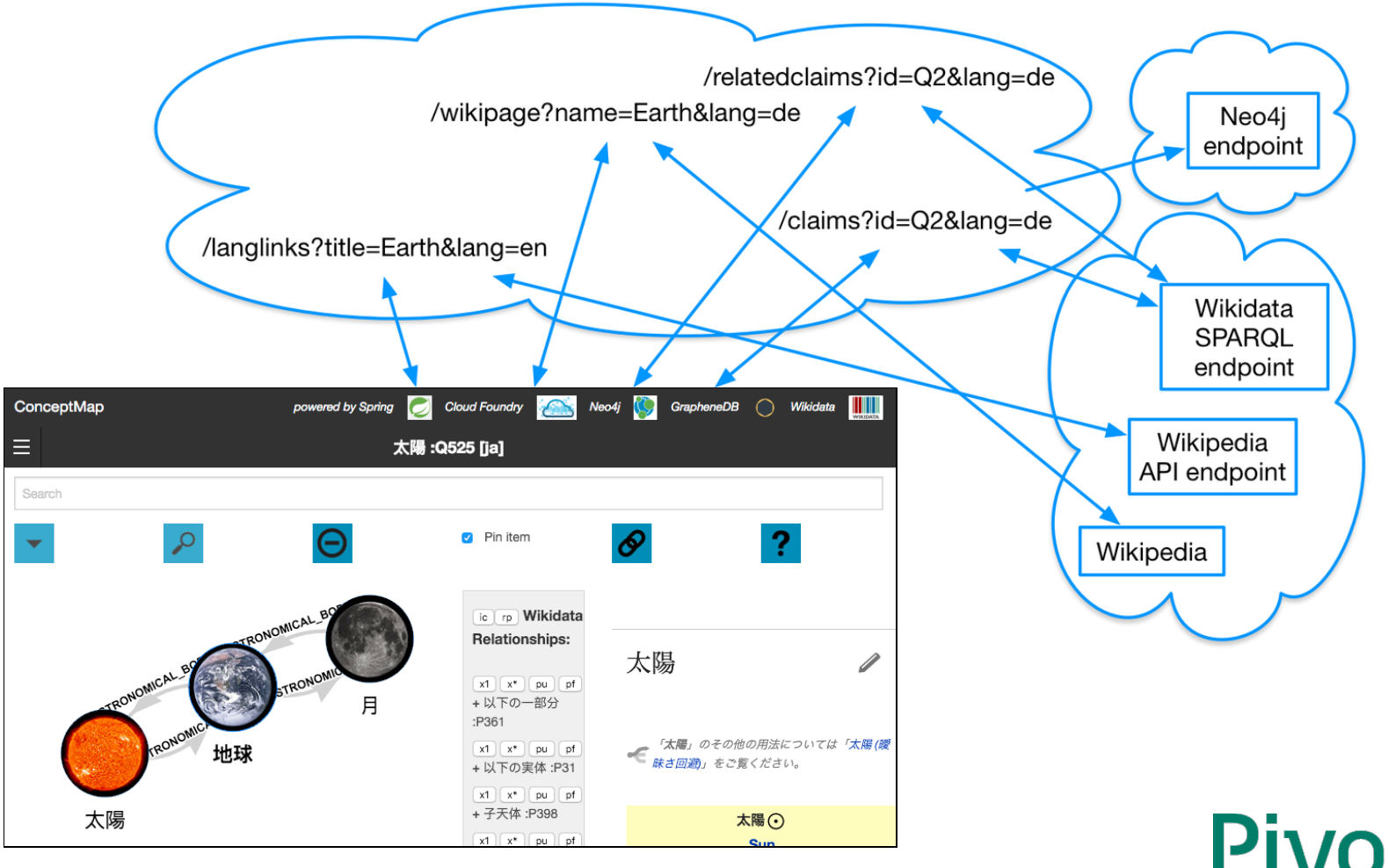
To learn more, see Building a RESTful Web Service Spring Guide

Resource representation

```
public class Item {
  private String type;
  private String id;

  public Item() {
  }

  public String getType() {
    return type;
  }

  public void setType(String type) {
    this.type = type;
  }

  public String getId() {
    return id;
  }

  public void setId(String id) {
    this.id = id;
  }
}
```

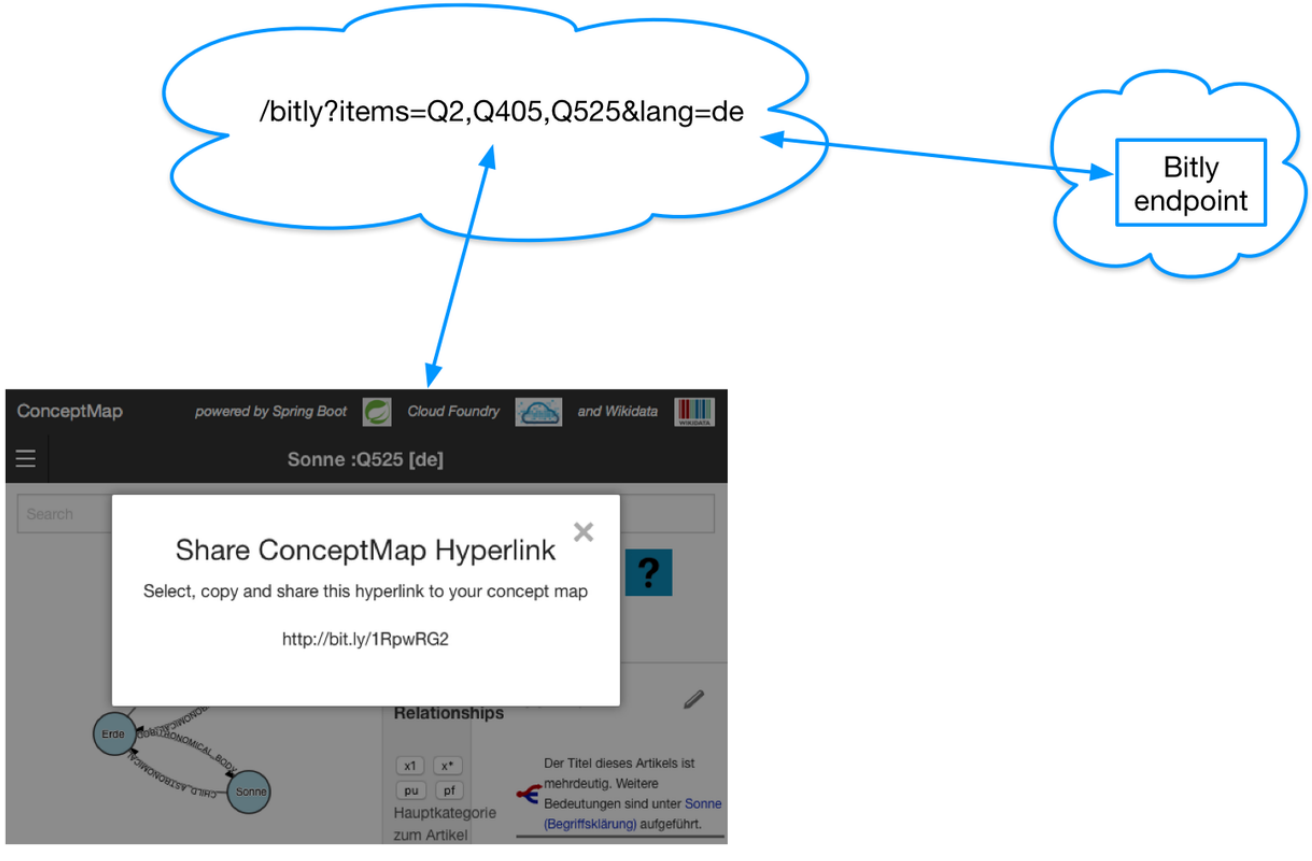
Pivotal™

Use case: Change language



Pivotal

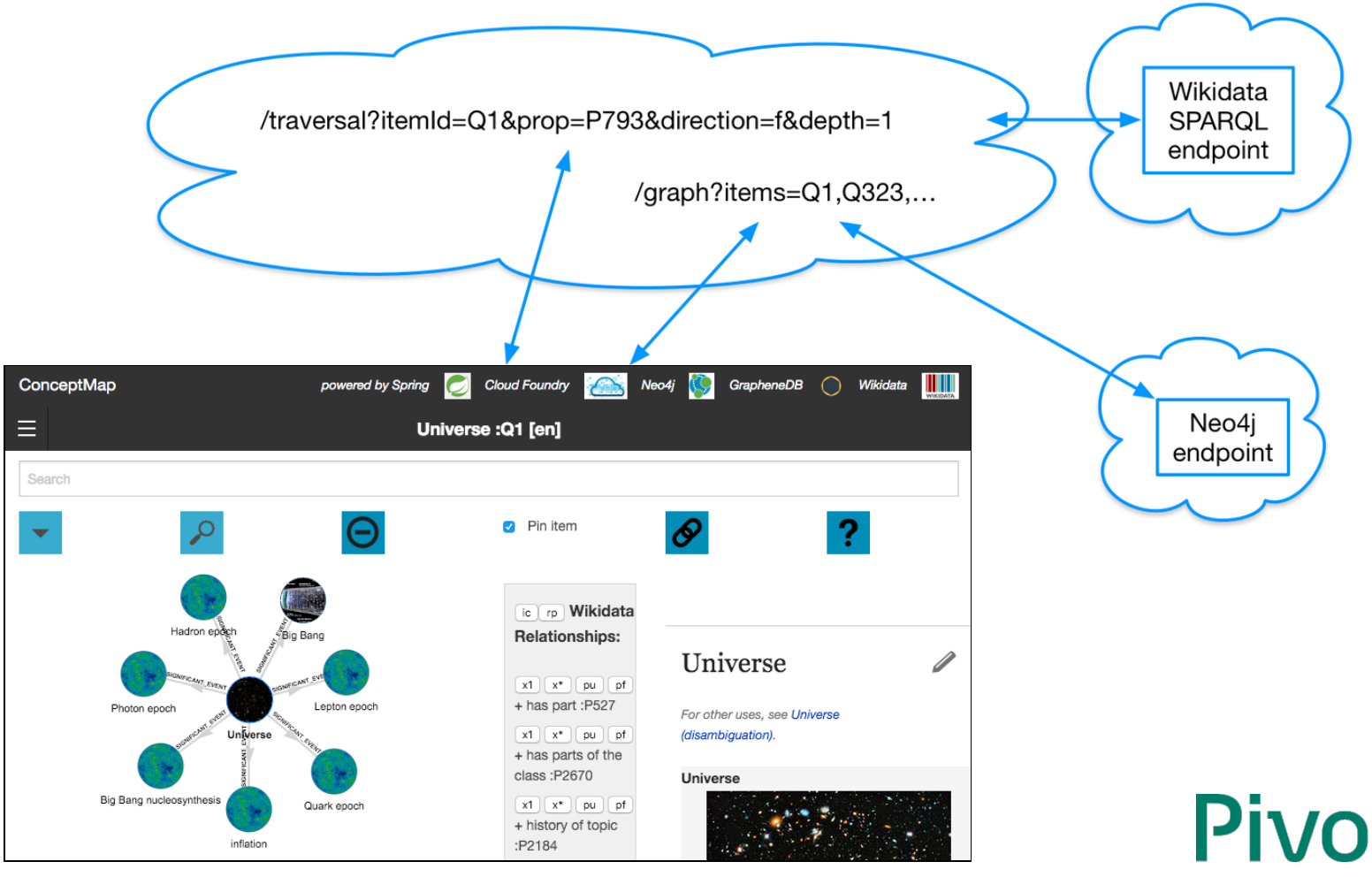
Use case: Share link



Pivotal™

Use case: Breadth-first search

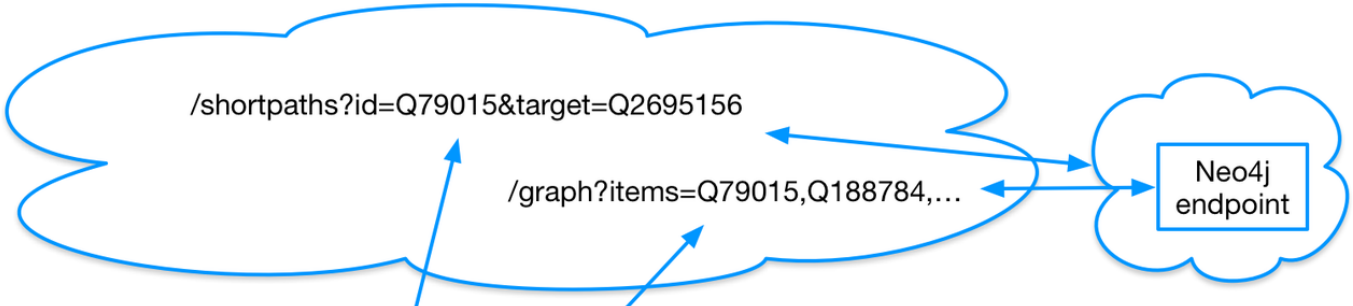
(expand items related by a given property to a given depth)

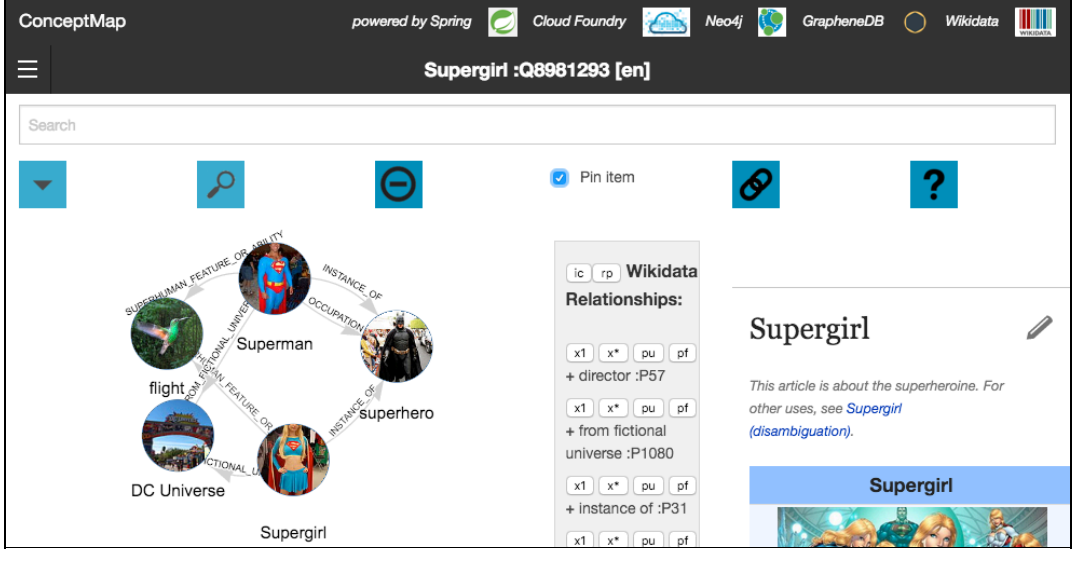


Pivotal™

Use case: Items in common

(all shortest paths, two hops or less)





Pivotal™

Neo4j Cypher query

(all shortest paths, two hops or less)

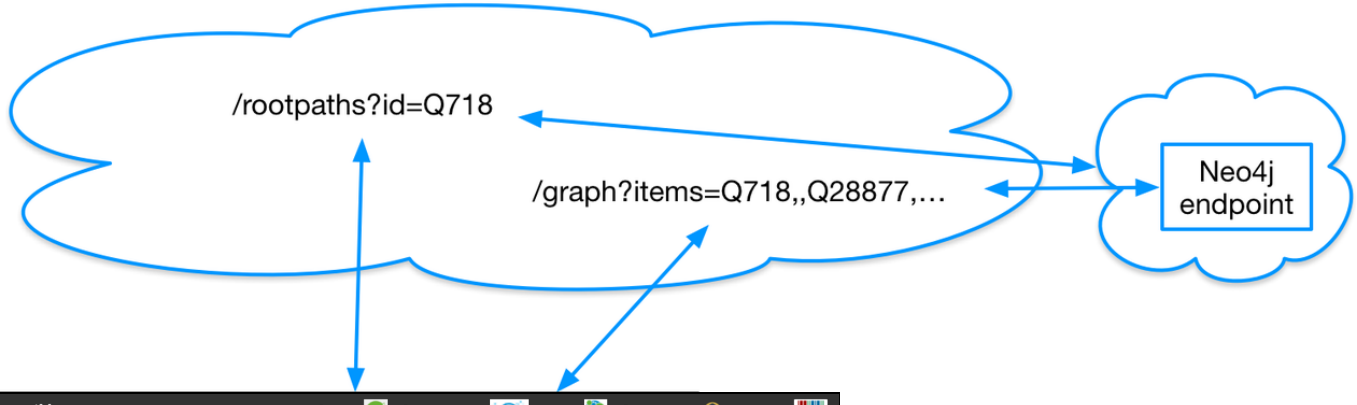
http://example/visshortpaths?id=Q111&target=Q313

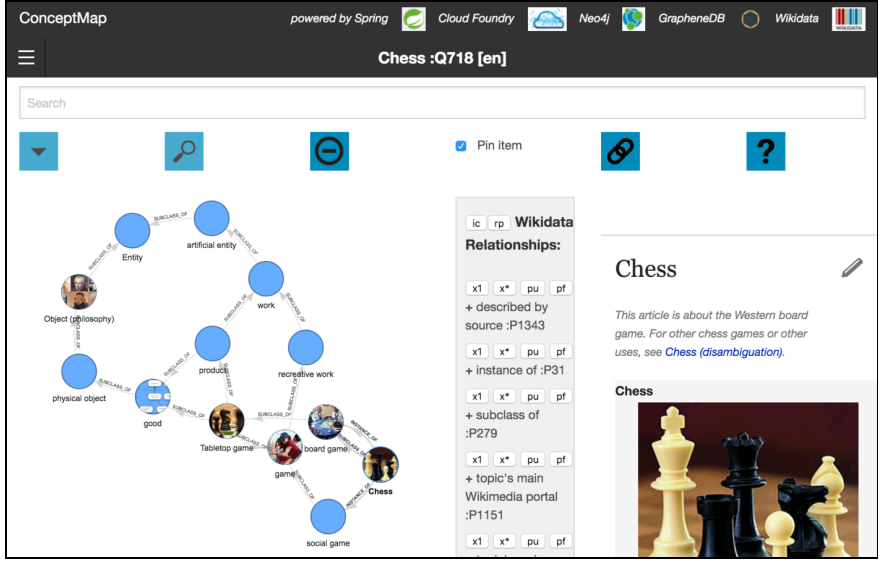
```
MATCH p=allShortestPaths(
  (a:Item {itemId:'Q111'})-[*..2]-(b:Item {itemId:'Q313'})
)
RETURN p
```

Pivotal

Use case: Navigate to root

(shortest path to Entity using subclass of, instance of, part of)





Pivotal™

Neo4j Cypher query

(shortest path to Entity using subclass of, instance of, part of)

http://example/visrootpaths?id=Q332

```
MATCH p=allShortestPaths(
  (a:Item {itemId:'Q332'})-[*]->(b:Item {itemId:'Q35120'})
)
WHERE NONE(x IN RELATIONSHIPS(p)
  WHERE (x.propId <> 'P279') AND
    (x.propId <> 'P31') AND
    (x.propId <> 'P361')
)
RETURN p
```

Pivotal™

Make the app executable

```
package com.javafxpert.wikibrowser;

import org.springframework.boot.SpringApplication;
import org.springframework.boot.autoconfigure.SpringBootApplication;
import org.springframework.boot.context.properties.EnableConfigurationProperties;

@EnableConfigurationProperties
@SpringBootApplication
public class WikiBrowserServiceApplication {

    public static void main(String[] args) {
        SpringApplication.run(WikiBrowserServiceApplication.class, args);
    }
}
```

To learn more, see Building a RESTful Web Service Spring Guide

Pivotal™

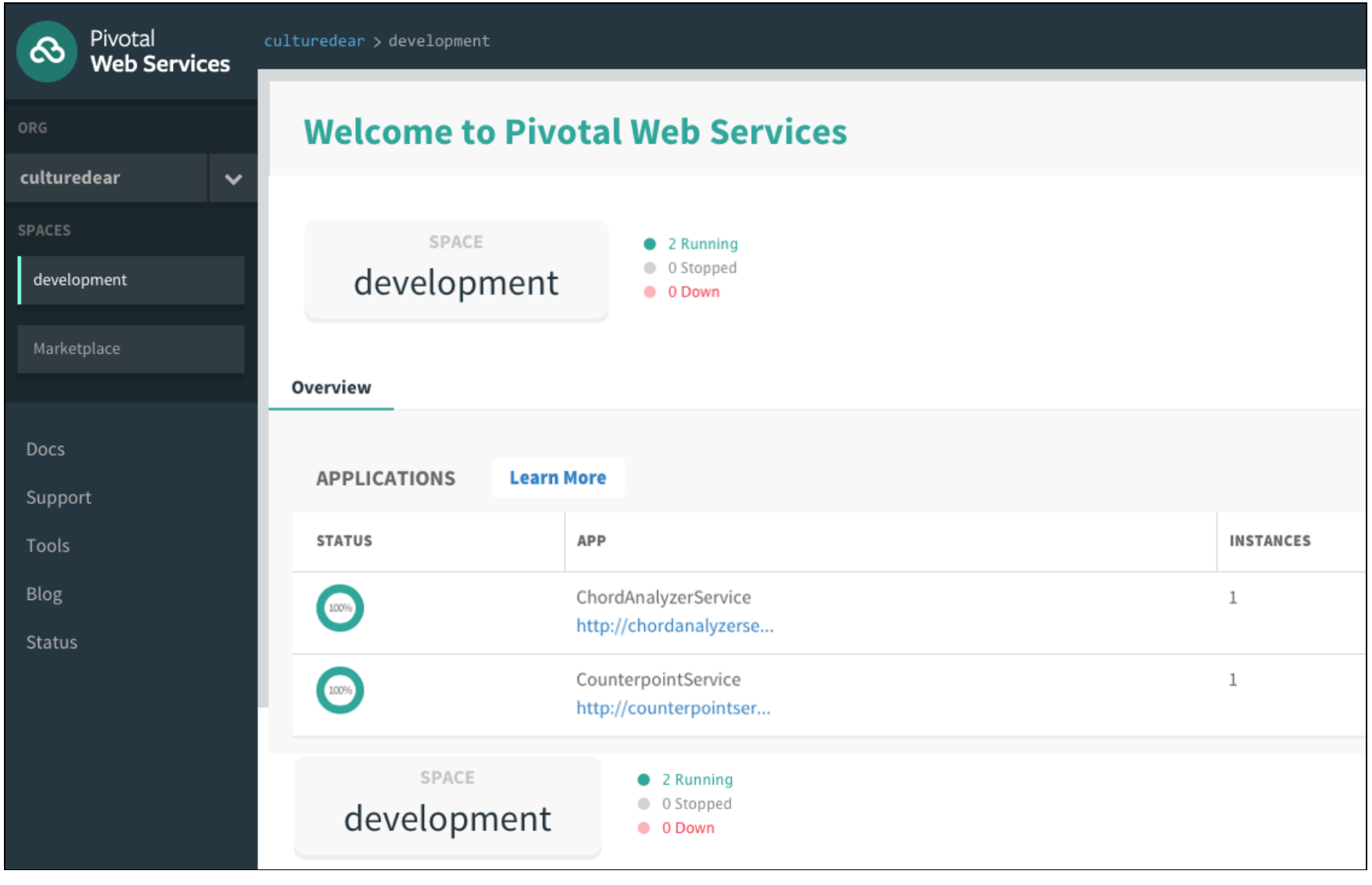
App build/deploy cycle

1. $ mvn clean install
2. $ cf push

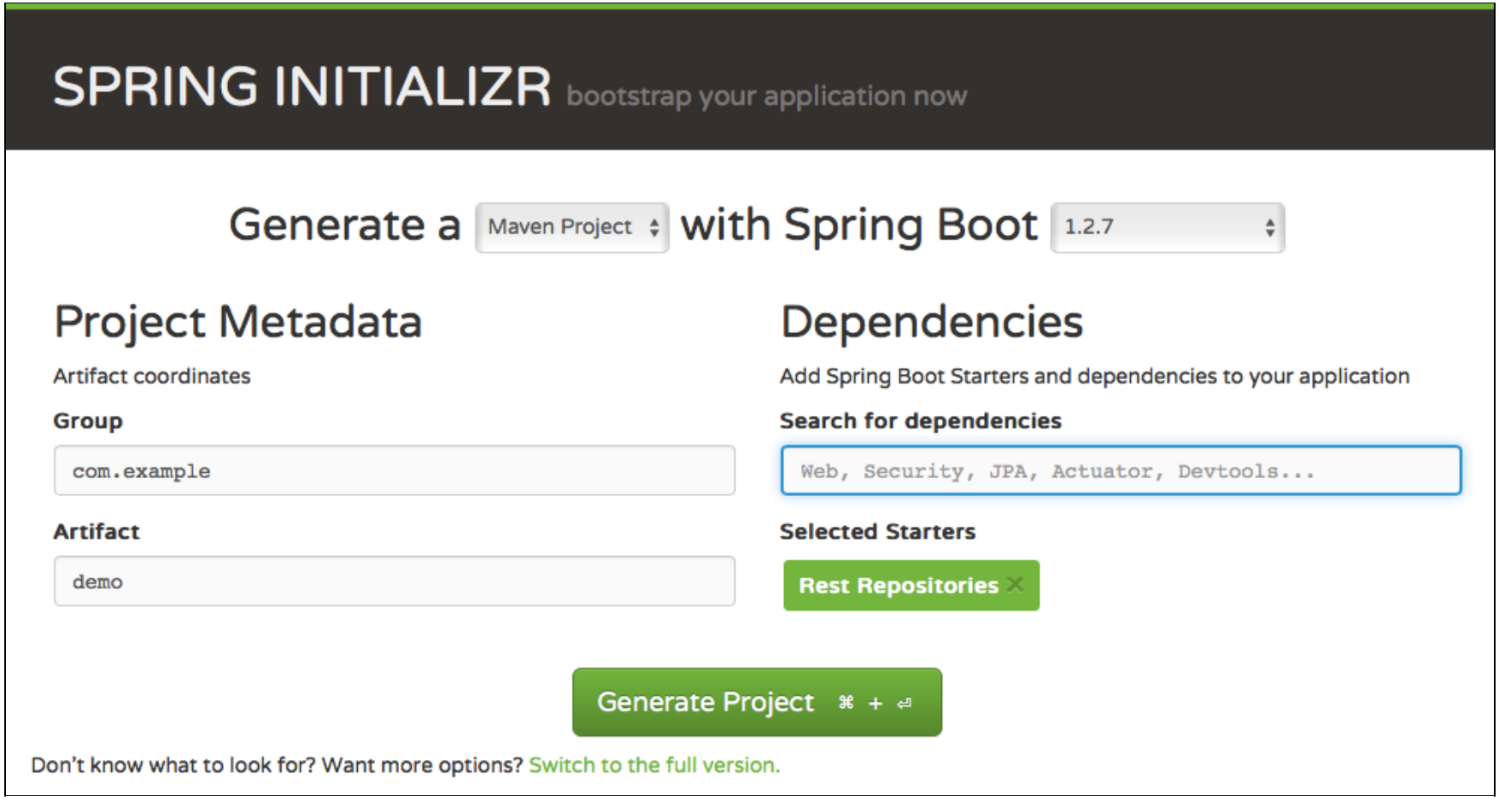
Note: One method of deployment for Spring Boot apps is a JAR file, which contains an embedded Tomcat servlet container.

Pivotal™

Pivotal Web Services Console



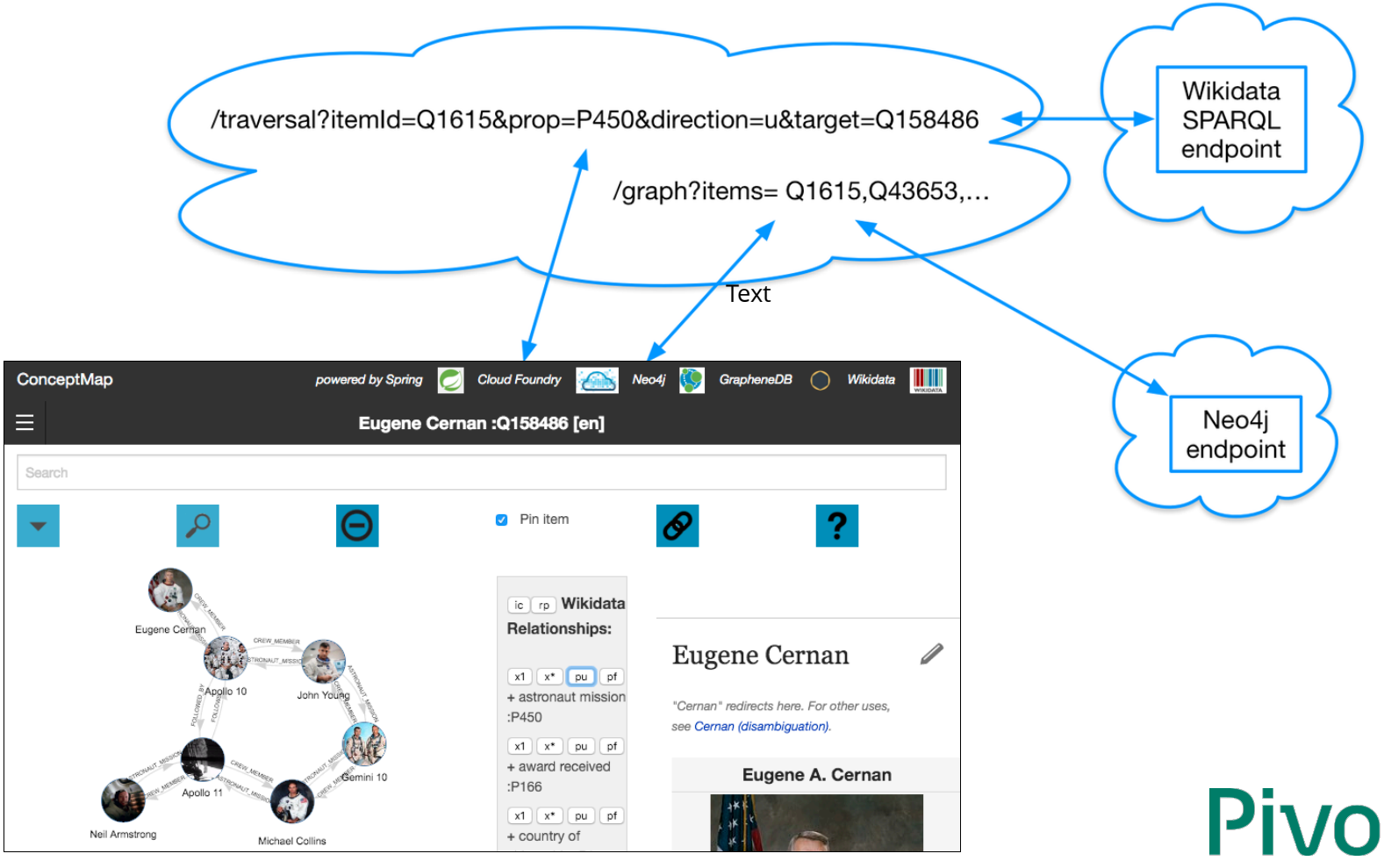
start.spring.io



Pivotal™

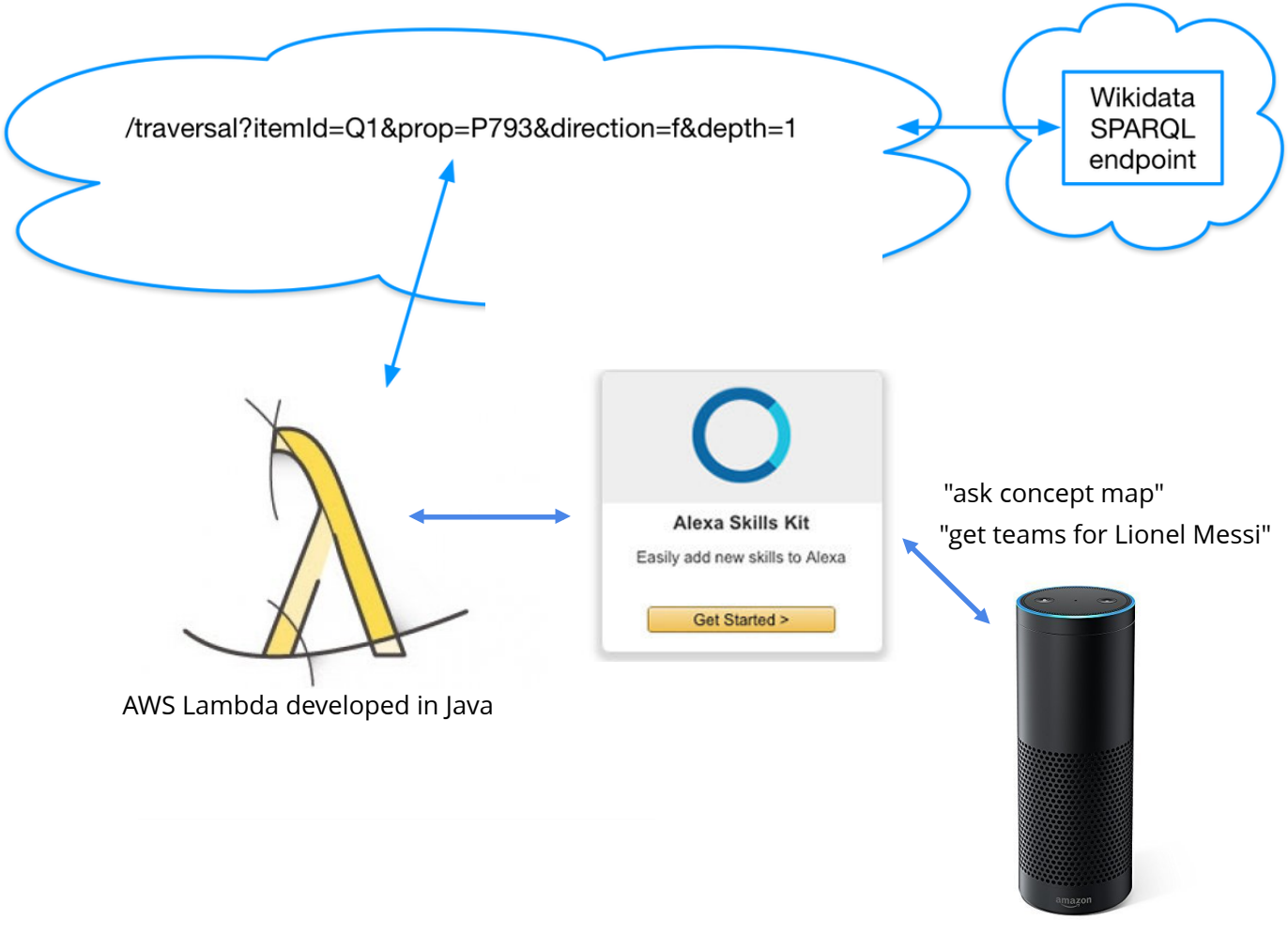
Use case: Degrees of separation

(shortest path, like Kevin Bacon game)



Pivotal™

Use case: Amazon Alexa



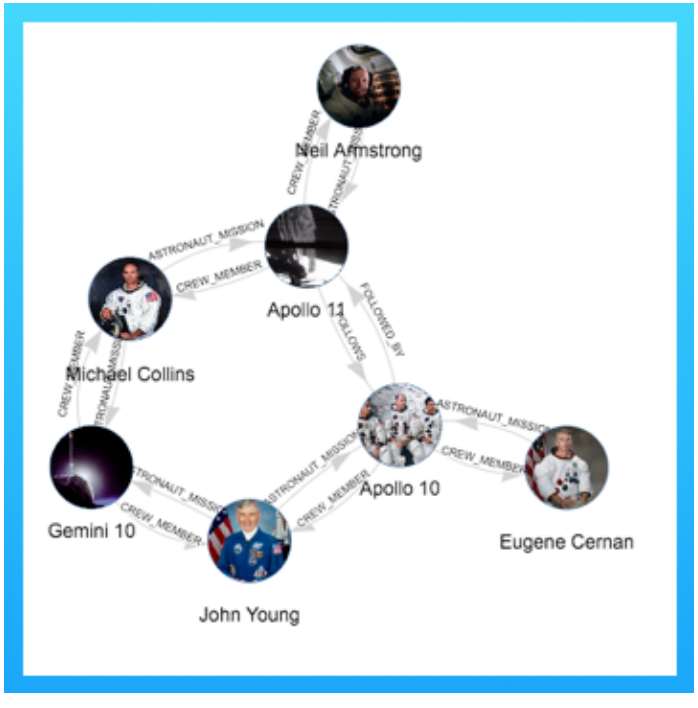
Pivotal

Hope you enjoyed

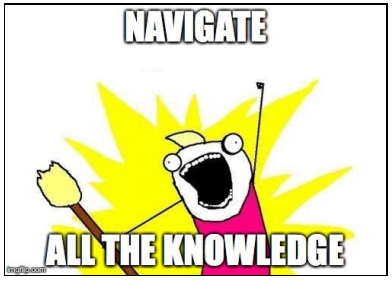
Navigate *All* the Knowledge

ConceptMap.io from a technical perspective

http://ConceptMap.io



James L. Weaver
Developer Advocate
Pivotal™



Twitter: @JavaFXpert
Email: jweaver@pivotal.io
http://JavaFXpert.com
http://CulturedEar.com