PhUSE CSS

Linked Data for Clinical Trials

An Interactive Hands-on Workshop

EXERCISES

Version 3.0

04 March 2018

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# Introduction

Instructions in this document are specific to the PhUSE cloud server environment, Graph Editor application and workshop methods. The exercises represent one of many possible approaches to the material and make no claim to be best or recommended method. The instructor will complete the exercises during the session, along with the attendees.

Your feedback is welcomed and encouraged. Please send your comments to: **tim.williams@PhUSE.eu**

## Materials

* Laptop with Remote Desktop capability
* Printed copies of the following will be supplied by the instructor:
  + Exercises (this document)
  + Info Sheet
  + Graph Editor Reference

## Symbols and Conventions

Symbols provide important information:

|  |  |
| --- | --- |
|  | Stop and wait. Do not proceed to the next section until instructed. |
| **!** | Cautions and warnings. Failure to follow these steps may lead to unanticipated results and problems. |
| IdeaIcon_clean_20mm | Helpful tips and advice. |
| Image result for information icon | Additional information. |

# Server Login

Login to the cloud server using Remote Desktop. Instructions assume Windows 10 operating system.

1. In the search box on the taskbar on your laptop, type **remote desk,** then select **Remote Desktop Connection** from the Programs section.﻿
2. Click **Show Options** if needed to show the fields for **Computer:** and **User name:**

The instructor will provide the password and an IP Address for the Computer: field.

**Computer:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_

(See Info Sheet)

**User name:** phuseldw

**Password:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(Provided by Instructor)

1. Entering values in the **Computer:** and **User name:** fields, then click **Connect**.
2. When prompted, enter the password supplied by the instructor and click **OK**.

|  |  |  |
| --- | --- | --- |
|  | Stop here and wait for the instructor.  Presentation follows |  |

# Exercises

# Create a Graph in the Graph Editor

# Open the Graph Editor

On the cloud server:

1. Open Google Chrome.
2. Click on "GraphEditor" on the shortcuts bar. 
3. The Graph Editor opens and shows two IRI nodes: One for **Drug-A** and one for the drug's name, **Serum114.**



Ask for assistance if you do not see these nodes.

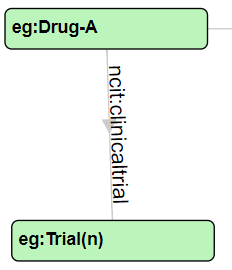
# Add a Clinical Trial, Trial Phase, and Treatment Arms

Create a node that represents unique clinical Trial conducted for Drug-A and the Treatments for that trial. Reference the Info Sheet for values where needed.

1. Create a Trial IRI node with these values:

Node values:

|  |  |  |
| --- | --- | --- |
| **Prefix:** | eg |  |
| **Label:** | *Info Sheet: x.x: [Trial1]* | Image result for information icon*See Info Sheet for value* |
| **Type:** | IRI |  |



1. Create the relation ***from*** Drug-A ***to*** the Trial node:

Link values:

|  |  |
| --- | --- |
| **Prefix:** | ncit |
| **Label:** | clinicaltrial |

1. Create a Trial Phase node. You may choose any of these phases: Phase2, Phase3, Phase4.

Node values:

|  |  |  |
| --- | --- | --- |
| **Prefix:** | ncit |  |
| **Label:** | *Choose a value:* | Image result for information icon*Possible values. There is NO SPACE in the name:*  *Phase2, Phase3, Phase4* |
| **Type:** | IRI |  |

1. Create the link from the Trial to the Trial Phase.

Link values:

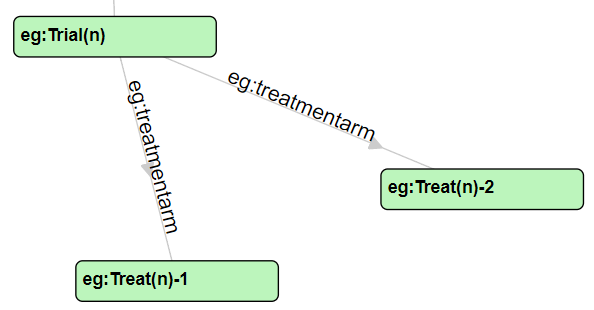
|  |  |
| --- | --- |
| **Prefix:** | ncit |
| **Label:** | phase |

1. Create two **treatment** nodes for the Trial.

Node values:

|  |  |  |
| --- | --- | --- |
| **Prefix:** | eg |  |
| **Label:** | *Info Sheet: x.x, x.x [Treat1-1,Treat1-2]* | Image result for information icon*See Info Sheet for values.* |
| **Type:** | IRI |  |

Ensure you have two treatment nodes in your graph.

1. Create the relations ***from*** the Trial ***to*** the two Treatment nodes.

Link values:

|  |  |  |
| --- | --- | --- |
| **Prefix:** | eg |  |
| **Label:** | treatmentarm | Image result for information icon*Label is all lowercase.* |

There should now be one treatmentarm link to each of the treatment nodes.

1. Create two "treatment type" nodes to represent Placebo and Active treatments

Node values:

|  |  |  |
| --- | --- | --- |
| **Prefix:** | eg |  |
| **Label:** | Placebo |  |
| **Type:** | IRI |  |

Node values:

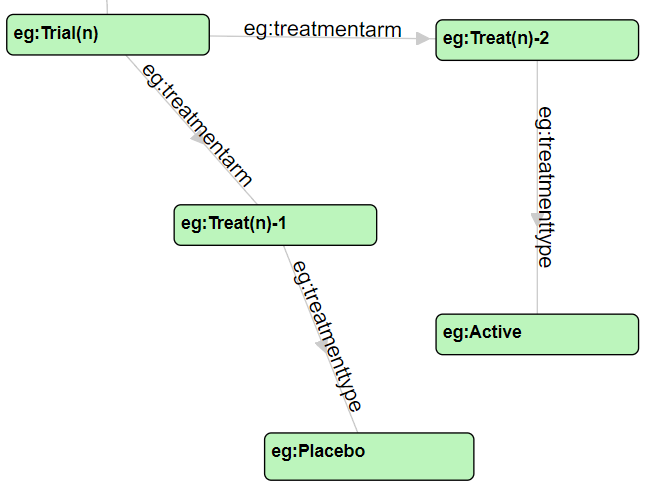
|  |  |  |
| --- | --- | --- |
| **Prefix:** | eg |  |
| **Label:** | Active |  |
| **Type:** | IRI |  |

1. Now join each Treatment node (created in step x) to one of the Treatment Type nodes using the following relationship. It does not matter which is the Active or Placebo. You will create two edges:

Link values:

|  |  |  |
| --- | --- | --- |
| **Prefix:** | eg |  |
| **Label:** | treatmenttype | Image result for information icon*Label is all lowercase.* |

The Trial and Treatment portion of your graph should look similar to:



<add step to save State>

# Add Persons and Treatments

1. Add three Person nodes to the graph:

Node values:

|  |  |  |
| --- | --- | --- |
| **Prefix:** | eg |  |
| **Label:** | *Info Sheet: x.x, x.x , x.x [Person10, Person11, Person12]* | Image result for information icon*See Info Sheet for values.* |
| **Type:** | IRI |  |

1. For two of the Person Nodes: Create "enrolledin" relations **from** the Person **to** the Trial node.

Link values:

|  |  |  |
| --- | --- | --- |
| **Prefix:** | eg |  |
| **Label:** | enrolledin | Image result for information icon*Label is all lowercase.* |

1. For the remaining Person node: Create an "primaryinvestigator" node **from** the Person node **to** the Trial node.

Link values:

|  |  |  |
| --- | --- | --- |
| **Prefix:** | eg |  |
| **Label:** | primaryinvestigator | Image result for information icon*Label is all lowercase.* |

1. For the two Person nodes who are enrolledin the Trial, assign one person to one of the treatments by creating the treatment link from the Person to the Treatment node.

Link values:

|  |  |  |
| --- | --- | --- |
| **Prefix:** | eg |  |
| **Label:** | treatment | Image result for information icon*Label is all lowercase.* |

The third person is the primary investigator and does not receive a treatment!

# Add Gender to Persons

1. Create nodes for Male and Female

Node values:

|  |  |  |
| --- | --- | --- |
| **Prefix:** | eg |  |
| **Label:** | Male |  |
| **Type:** | IRI |  |

Node values:

|  |  |  |
| --- | --- | --- |
| **Prefix:** | eg |  |
| **Label:** | Female |  |
| **Type:** | IRI |  |

2. Create links **from** all 3 Person nodes **to** a gender using the Link:

Link values:

|  |  |  |
| --- | --- | --- |
| **Prefix:** | eg |  |
| **Label:** | gender | Image result for information icon*Label is all lowercase.* |

<Add step to Save State>

# Optional Nodes and Links

Time permitting, consider adding the following nodes.

A. Add names to Persons:

1. Create Name nodes as strings:

Node values:

|  |  |  |
| --- | --- | --- |
| **Prefix:** |  | Image result for information iconPrefix is not applicable to literals |
| **Label:** | *<any name you want!>* |  |
| **Type:** | STRING |  |

2. Link **from** a Person **to** a Name:

Link values:

|  |  |  |
| --- | --- | --- |
| **Prefix:** | schema | Image result for information icon Many other prefixes could be used here. |
| **Label:** | name |  |

B. Add age (in years) to Person nodes

1. Create Age nodes as INT (integers):

Node values:

|  |  |  |
| --- | --- | --- |
| **Prefix:** |  | Image result for information iconPrefix is not applicable to literals. |
| **Label:** | *<any name you want!>* |  |
| **Type:** | STRING |  |

2. Link **from** a Person **to** an age:

Link values:

|  |  |  |
| --- | --- | --- |
| **Prefix:** | eg | Image result for information icon eg is used because age calculation may be specific to this graph. |
| **Label:** | age |  |

C. Add additional Person nodes and assign them to a Treatment.

D. Add additional treatments, or add details to the existing treatments.

<Add step to Save State>

|  |  |  |
| --- | --- | --- |
|  | Stop here and wait for the instructor. |  |

# Export to TTL

[steps to export. finding the file, etc.]

Open and view the TTL

|  |  |  |
| --- | --- | --- |
|  | Stop here and wait for the instructor.  Presentation follows |  |

< Presentation on Ontology goes here>

# Ontology

Steps to Load and view the ontology for this graph using Protege.

# Upload to Triplestore

[steps to upload both the Graph and Ontology to Stardog]

# Querying your graph

# Queries without Reasoning

Show all s-p-o relations.

How many people enrolled in your study?

# Queries with Reasoning.

x.x What "types of things" are in your graph? Which ones are unexpected?

x.x Find all HumanStudySubject nodes (Persons enrolled in Clinical Trials)

x.x Find all "PERSON" nodes : (both human study subjects and investigators)

|  |  |  |
| --- | --- | --- |
|  | Stop here and wait for the instructor.  Presentation follows |  |

<PRESENTATION HERE: Merging Graphs, and Federated Queries>

# Federated Query\* (\*assumes can be configured for workshop)

# How many trials were conducted for Drug-A?

# How many of each Phase?

# How many patients participated in Drug-A trials?

# What is the gender breakdown for all Drug-A trials?

# Identify patients that participated in multiple trials.

Congratulations! You've made to the

---- END OF THE EXERCISES ----

|  |  |  |
| --- | --- | --- |
|  | Stop here and wait for the instructor.  Presentation follows |  |

# Appendix 1: Course Resources

* [Introduction to Semantic Web](http://www.cambridgesemantics.com/semantic-university/introduction-semantic-web)

http://www.cambridgesemantics.com/semantic-university/introduction-semantic-web

* [What is Linked Data?](http://www.cambridgesemantics.com/semantic-university/what-linked-data)

http://www.cambridgesemantics.com/semantic-university/what-linked-data

* [Introduction to Linked data](http://www.cambridgesemantics.com/semantic-university/introduction-linked-data)

http://www.cambridgesemantics.com/semantic-university/introduction-linked-data

* [Learning SPARQL](http://www.learningsparql.com/)

http://www.learningsparql.com/

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[Hands-on Workshop Github Repository](https://github.com/phuse-org/LinkedDataWorkshop/tree/master/Annual2017-EU)

Course content is available at:

https://github.com/phuse-org/LinkedDataWorkshop/tree/master/Annual2017-EU