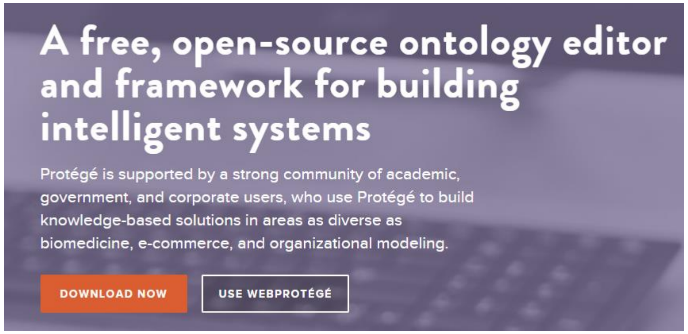
Knowledge Modeling (I) - Protege

一、下载配置

Protege配置

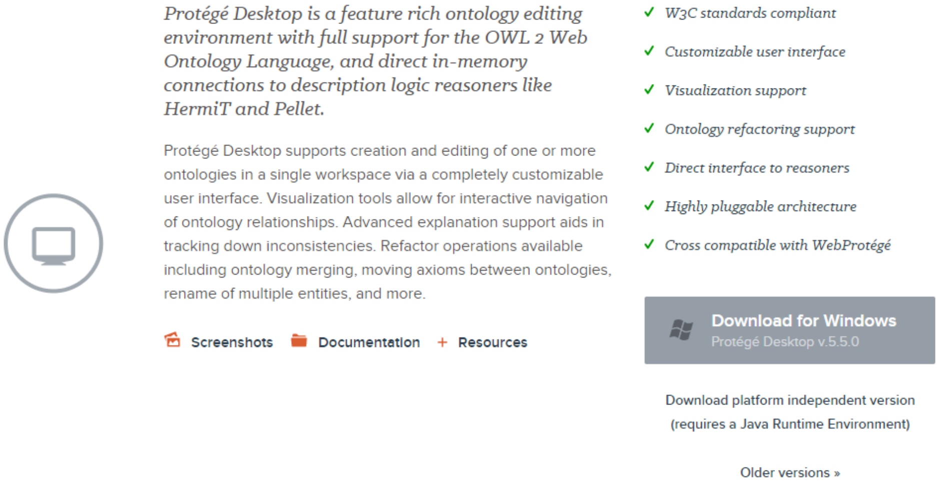
主页：

https://protege.stanford.edu/



A free, open-source ontology editor and framework for building intelligent systems

Protégé is supported by a strong community of academic, government, and corporate users, who use Protégé to build knowledge-based solutions in areas as diverse as biomedicine, e-commerce, and organizational modeling.



Protégé Desktop is a feature rich ontology editing environment with full support for the OWL 2 Web Ontology Language, and direct in-memory connections to description logic reasoners like HermiT and Pellet.

Protégé Desktop supports creation and editing of one or more ontologies in a single workspace via a completely customizable user interface. Visualization tools allow for interactive navigation of ontology relationships. Advanced explanation support aids in tracking down inconsistencies. Refactor operations available including ontology merging, moving axioms between ontologies, rename of multiple entities, and more.

- ✓ *W3C standards compliant*
- ✓ *Customizable user interface*
- ✓ *Visualization support*
- ✓ *Ontology refactoring support*
- ✓ *Direct interface to reasoners*
- ✓ *Highly pluggable architecture*
- ✓ *Cross compatible with WebProtégé*

Download platform independent version (requires a Java Runtime Environment)

Older versions »

【此处示例采用windows版本】

点击 Download Now 进入下载页面

点击 Download for Windows 下载软件包

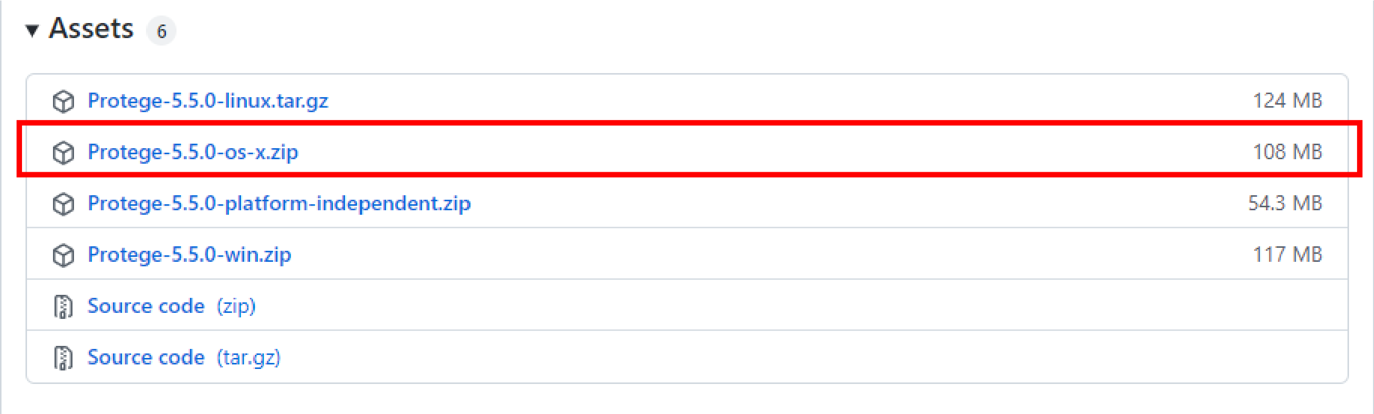
得到 Protege Desktop v.5.5.0 版本的压缩包

Protege配置

Mac版本下载

打开链接：

https://github.com/protegeproject/protege-distribution/releases



▾ Assets 6

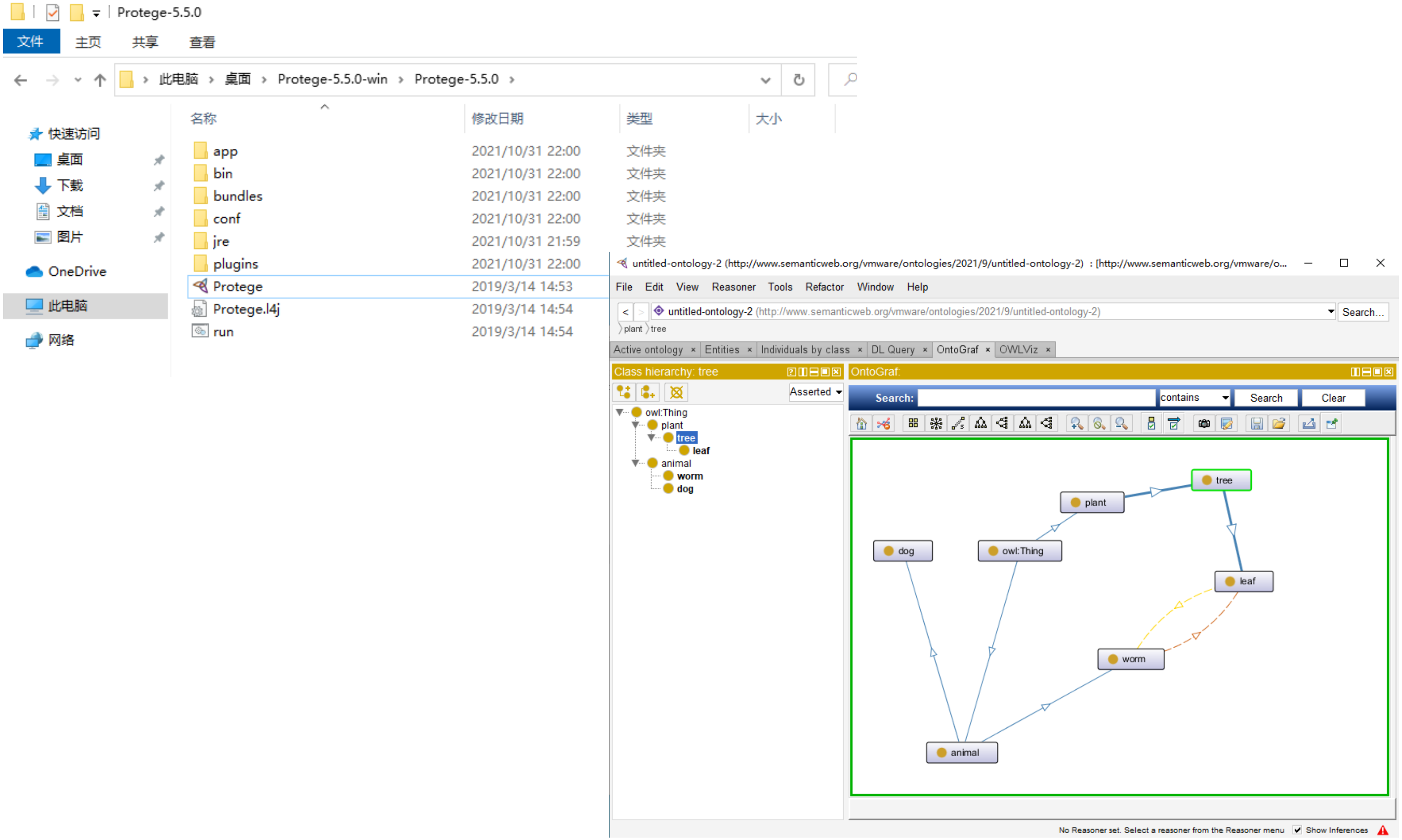
Protege-5.5.0-linux.tar.gz	124 MB
Protege-5.5.0-os-x.zip	108 MB
Protege-5.5.0-platform-independent.zip	54.3 MB
Protege-5.5.0-win.zip	117 MB
Source code (zip)	
Source code (tar.gz)	

下载 Protege-5.5.0-os-x.zip

解压后只有一个.app文件，拷贝到应用程序后，即视为安装完成

Protege配置

解压完成后直接打开Protege.exe即可正常使用



名称	修改日期	类型	大小
app	2021/10/31 22:00	文件夹	
bin	2021/10/31 22:00	文件夹	
bundles	2021/10/31 22:00	文件夹	
conf	2021/10/31 22:00	文件夹	
jre	2021/10/31 21:59	文件夹	
plugins	2021/10/31 22:00	文件夹	
Protege	2019/3/14 14:53		
Protege.l4j	2019/3/14 14:54		
run	2019/3/14 14:54		

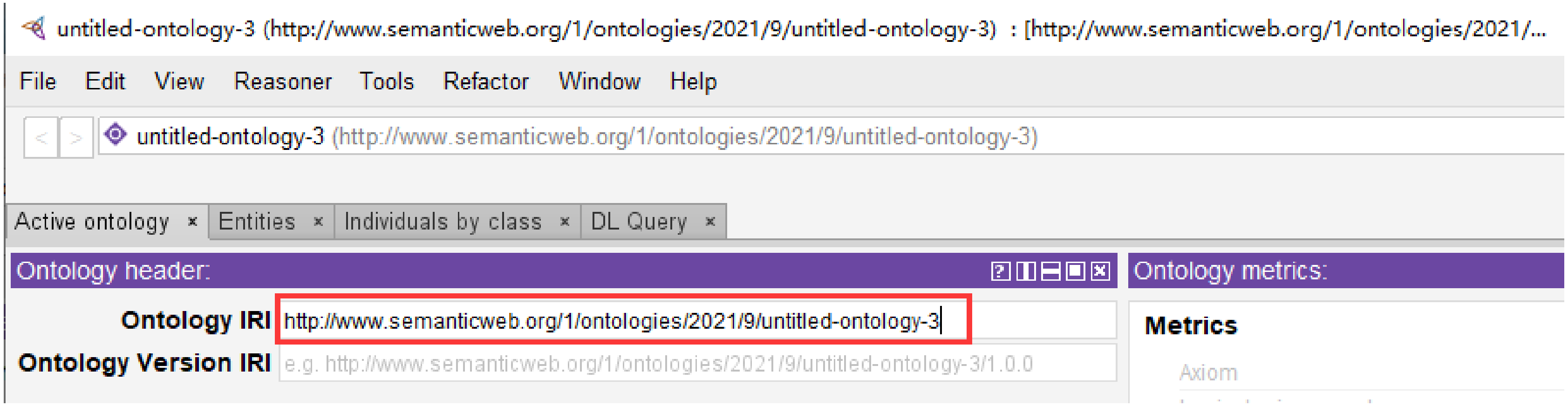
untitled-ontology-2 (http://www.semanticweb.org/vmware/ontologies/2021/9/untitled-ontology-2) : [http://www.semanticweb.org/vmware/o...

- owl:Thing
  - plant
    - tree
      - leaf
  - animal
    - worm
    - dog

No Reasoner set. Select a reasoner from the Reasoner menu ☑ Show Inferences

二、知识（本体）建模示例

设置本体IRI

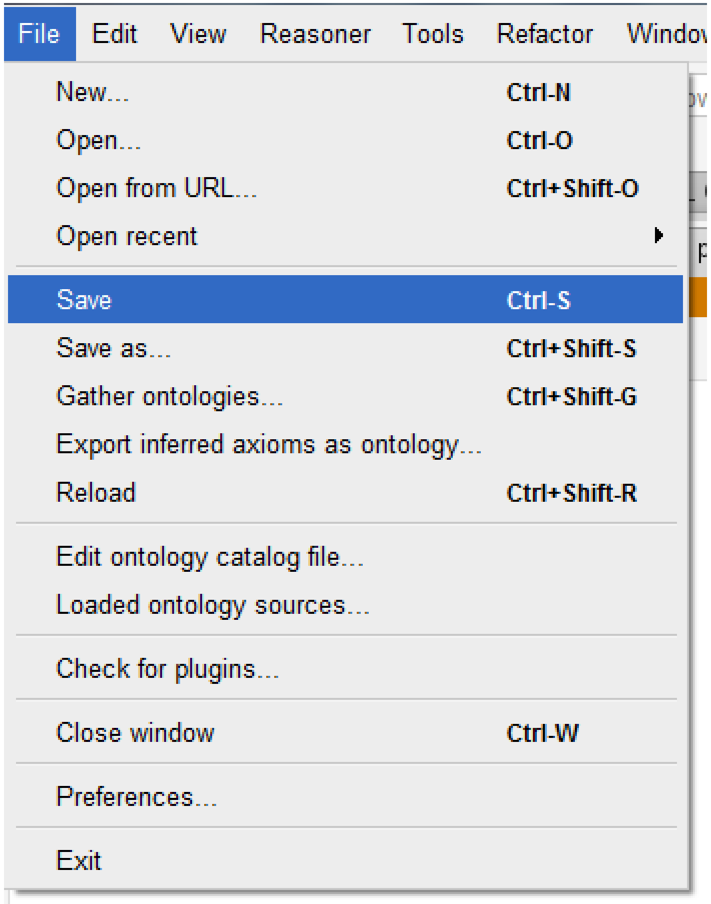

untitled-ontology-3 (http://www.semanticweb.org/1/ontologies/2021/9/untitled-ontology-3) : [http://www.semanticweb.org/1/ontologies/2021/...

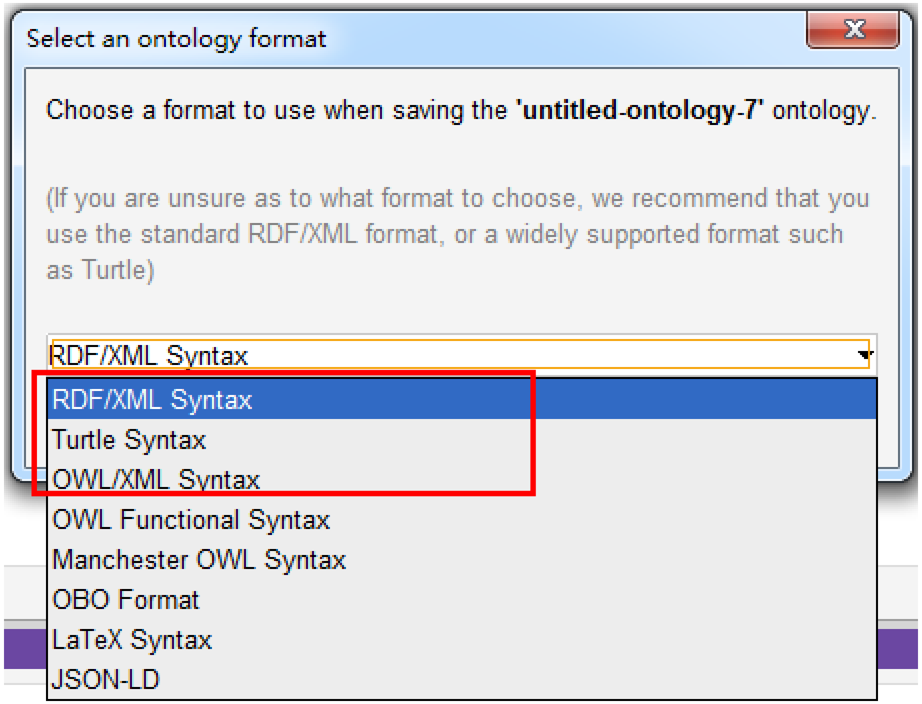
Ontology IRI http://www.semanticweb.org/1/ontologies/2021/9/untitled-ontology-3

Ontology Version IRI e.g. http://www.semanticweb.org/1/ontologies/2021/9/untitled-ontology-3/1.0.0

设置为：http://www.seu.edu.cn/ontologies/pizza.owl

设置保存格式




Select an ontology format

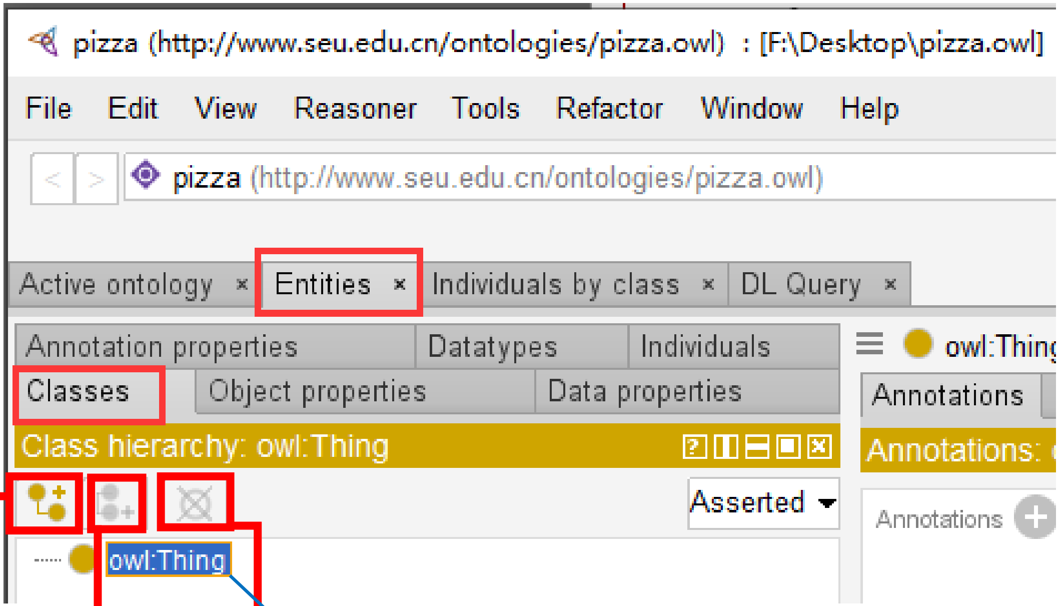
Choose a format to use when saving the 'untitled-ontology-7' ontology.

(If you are unsure as to what format to choose, we recommend that you use the standard RDF/XML format, or a widely supported format such as Turtle)

RDF/XML Syntax

创建Class

选择 “Entities” → “Classes”，创建Classes



Add subclass

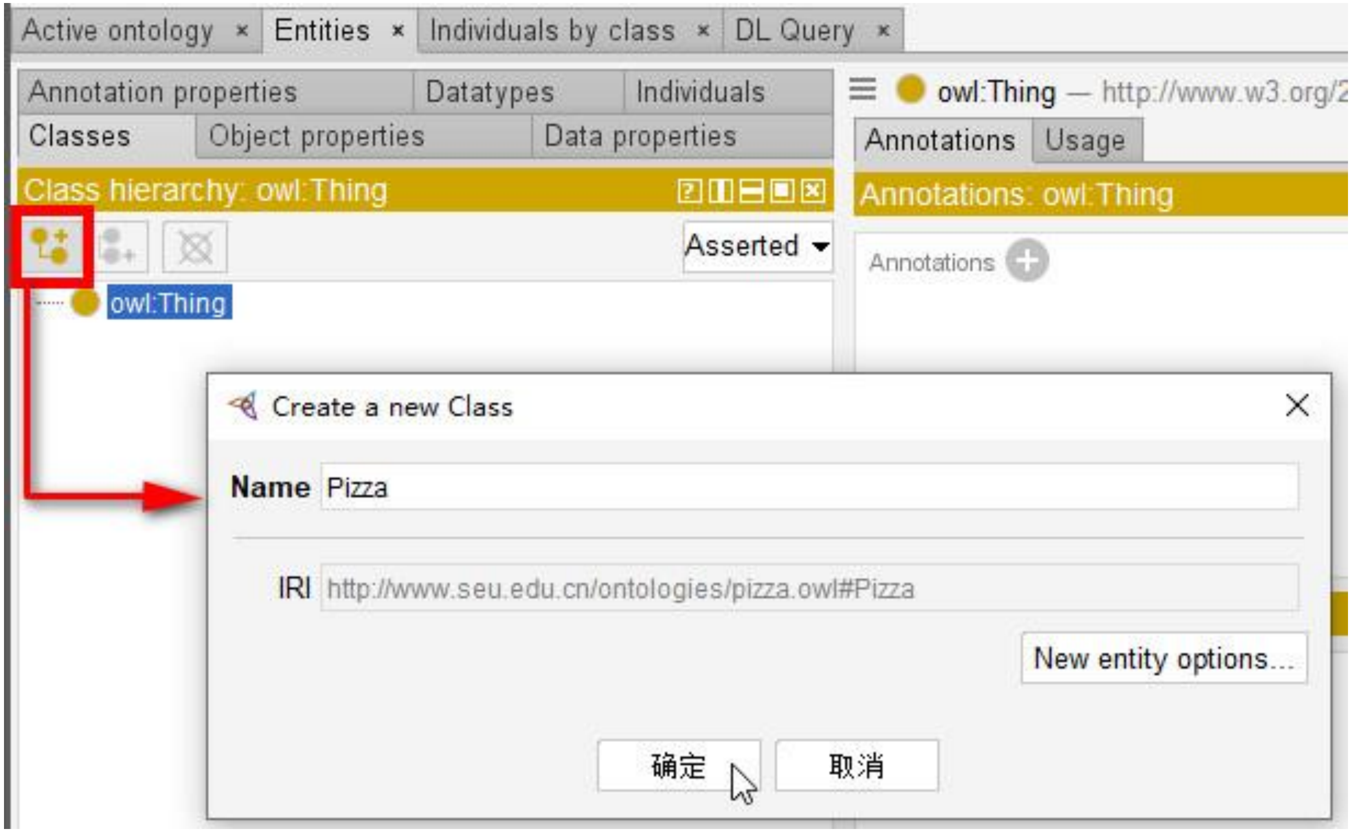
Add sibling class

Delete class

初始的class hierarchy tree

创建Class

选中“owl: Thing”，创建其subclass “Pizza”

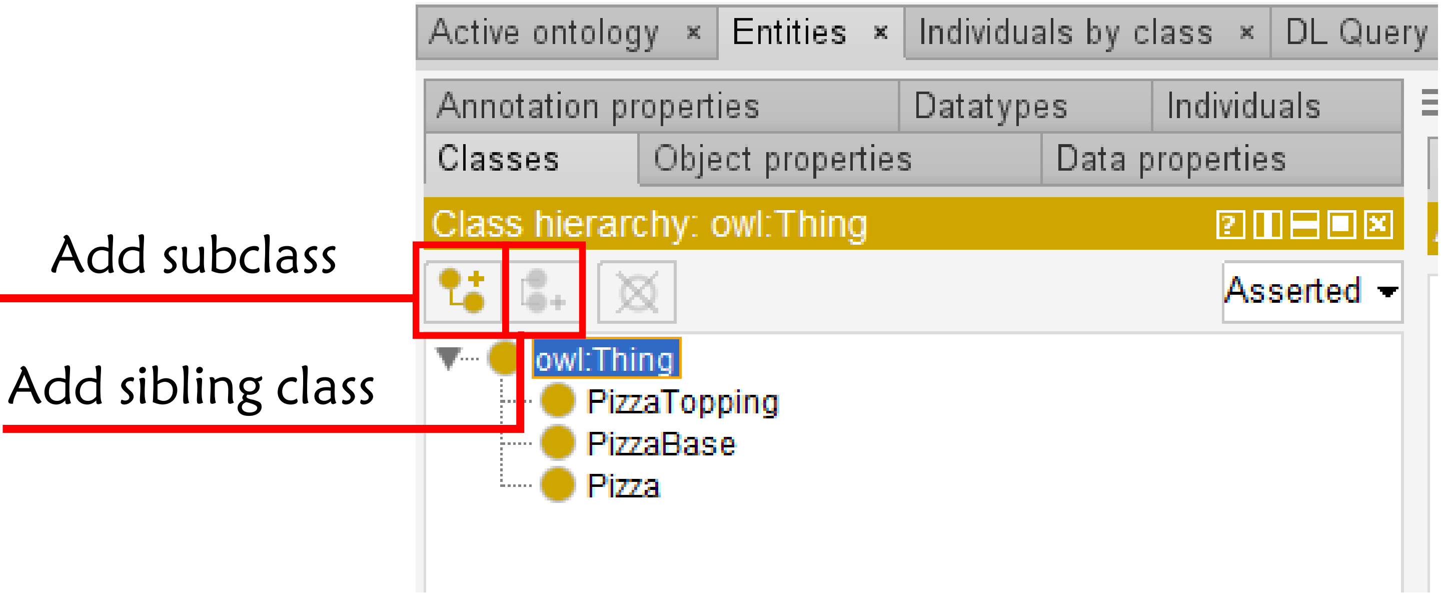


Name: Pizza

IRI: http://www.seu.edu.cn/ontologies/pizza.owl#Pizza

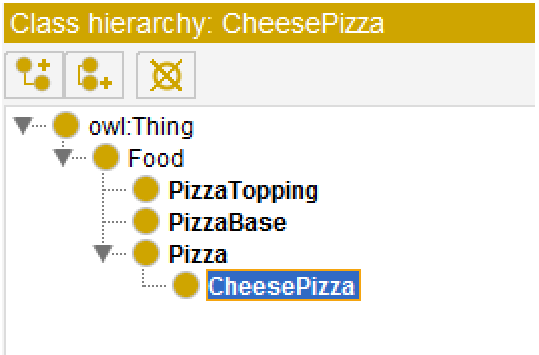
创建Class

创建“owl: Thing”的subclass “PizzaTopping”与“PizzBase”



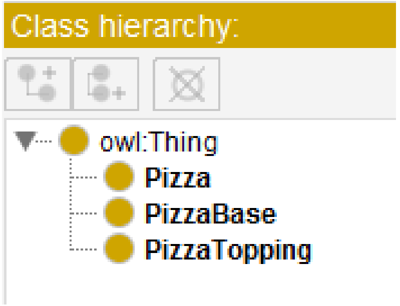
小练习

创建“Pizza”的subclass“CheesePizza”,与“Pizza”、“PizzaBase”、“PizzaTopping”的superclass“Food”，同时也是“owl:Thing”的subclass。



Class hierarchy: CheesePizza

owl:Thing
Food
PizzaTopping
PizzaBase
Pizza
CheesePizza



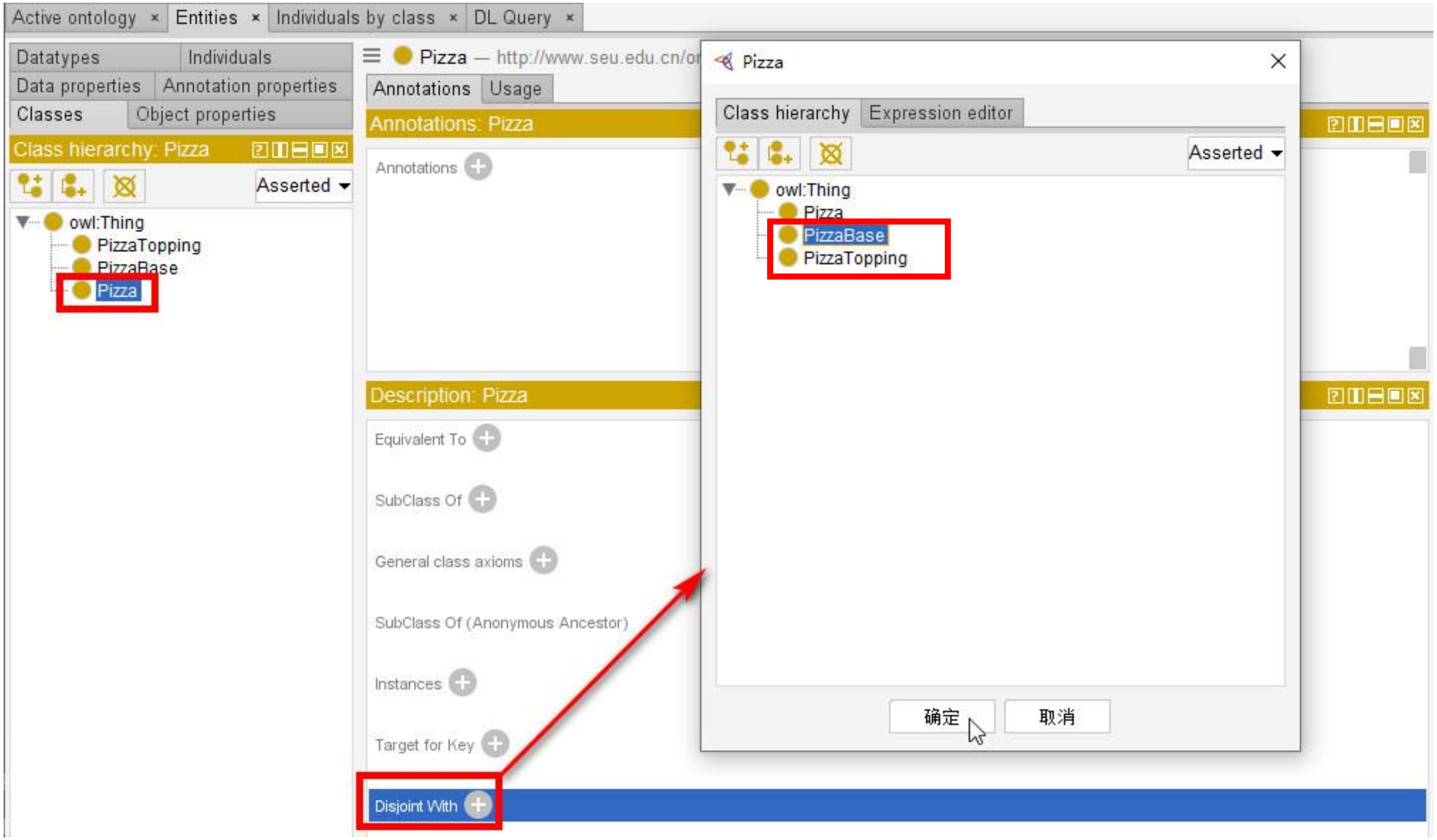
Class hierarchy:

owl:Thing
Pizza
PizzaBase
PizzaTopping

完成创建后可删除，恢复class hierarchy的原始结构

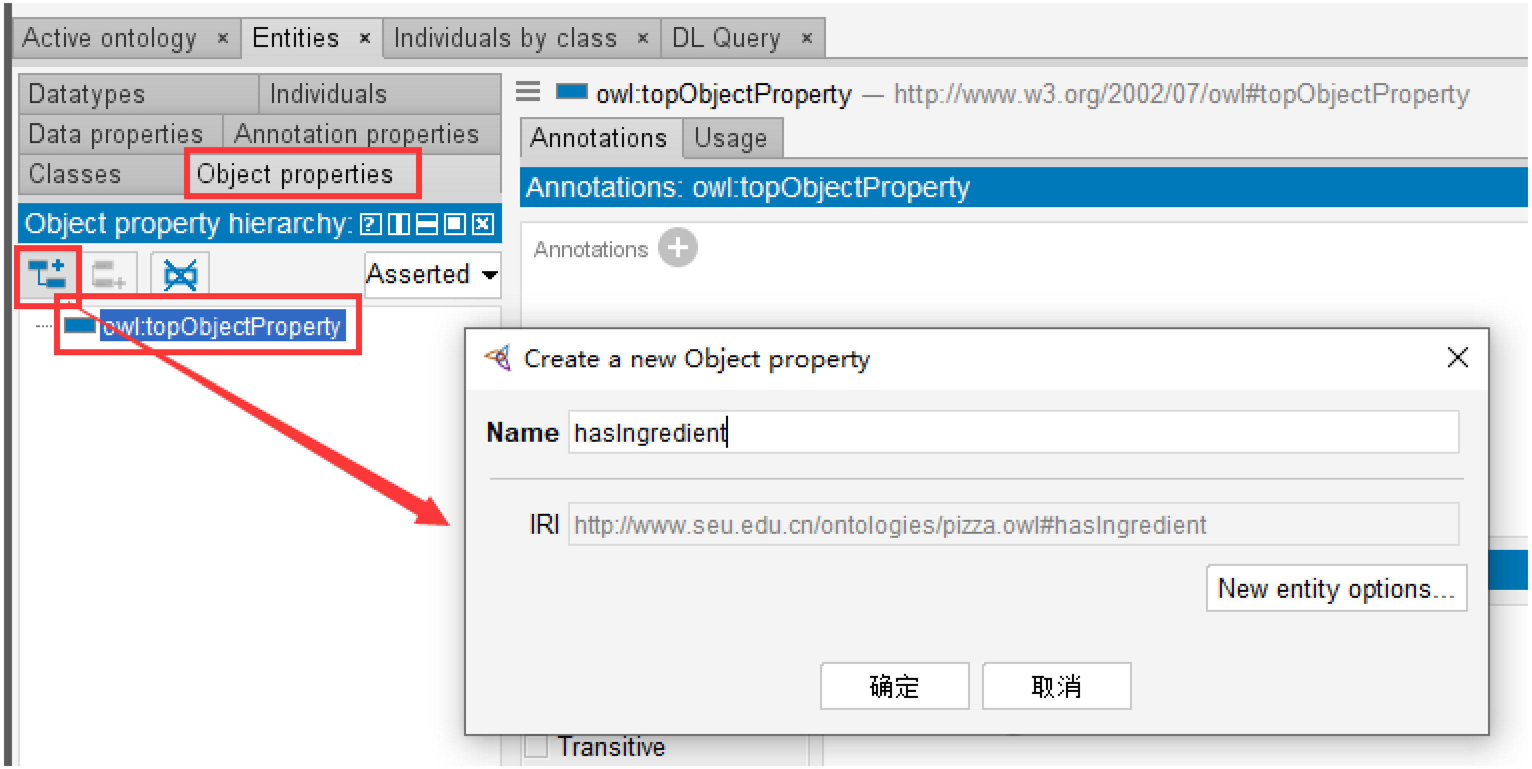
创建disjoint关系

为“Pizza”同时选择多个disjoint class，则两两均disjoint



创建Object Property (properties between individuals)

选择 “Entities” → “Object properties”，创建 “owl:topObjectProperty” 的subproperty “hasIngredient”



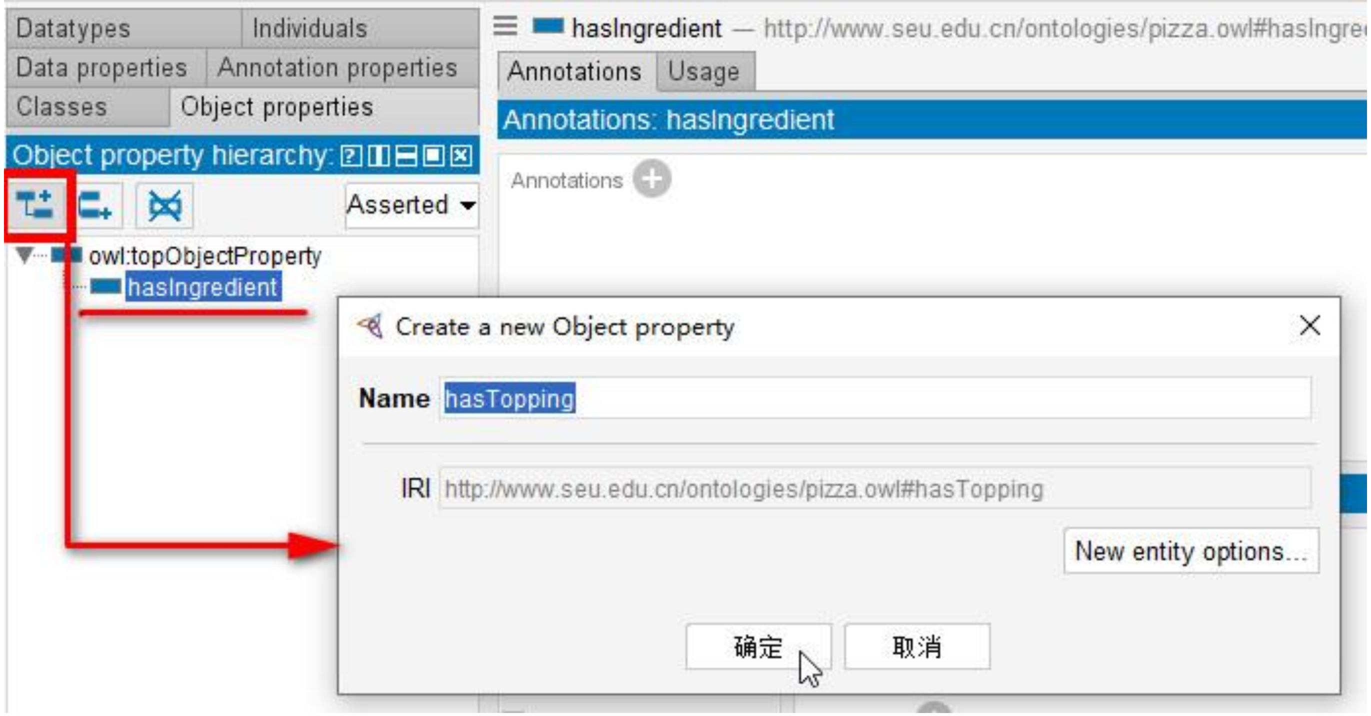
Create a new Object property

Name hasIngredient

IRI http://www.seu.edu.cn/ontologies/pizza.owl#hasIngredient

创建Object Property

创建 “hasIngredient” 的subproperty “hasTopping” 与 “hasBase”

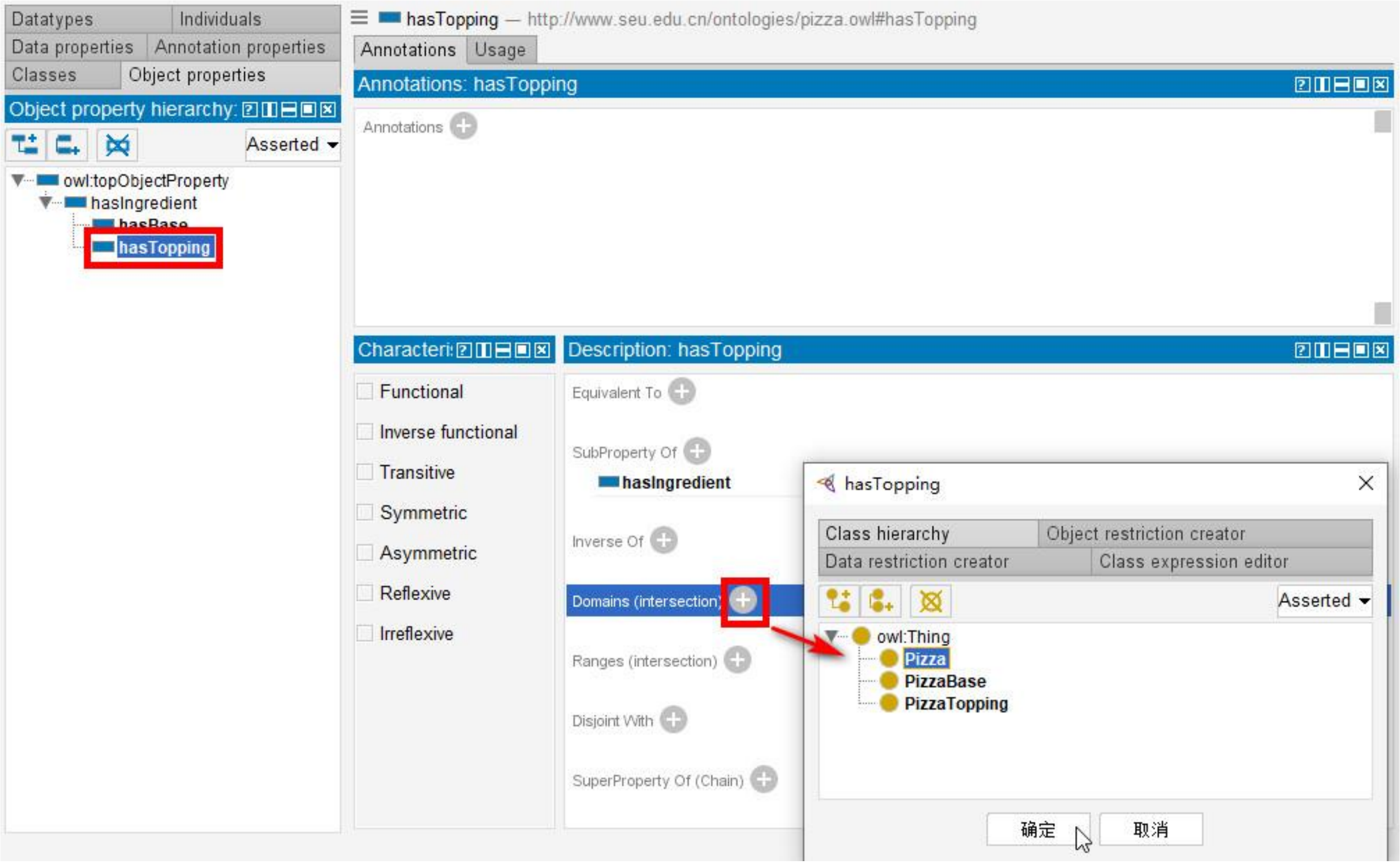


Name hasTopping

IRI http://www.seu.edu.cn/ontologies/pizza.owl#hasTopping

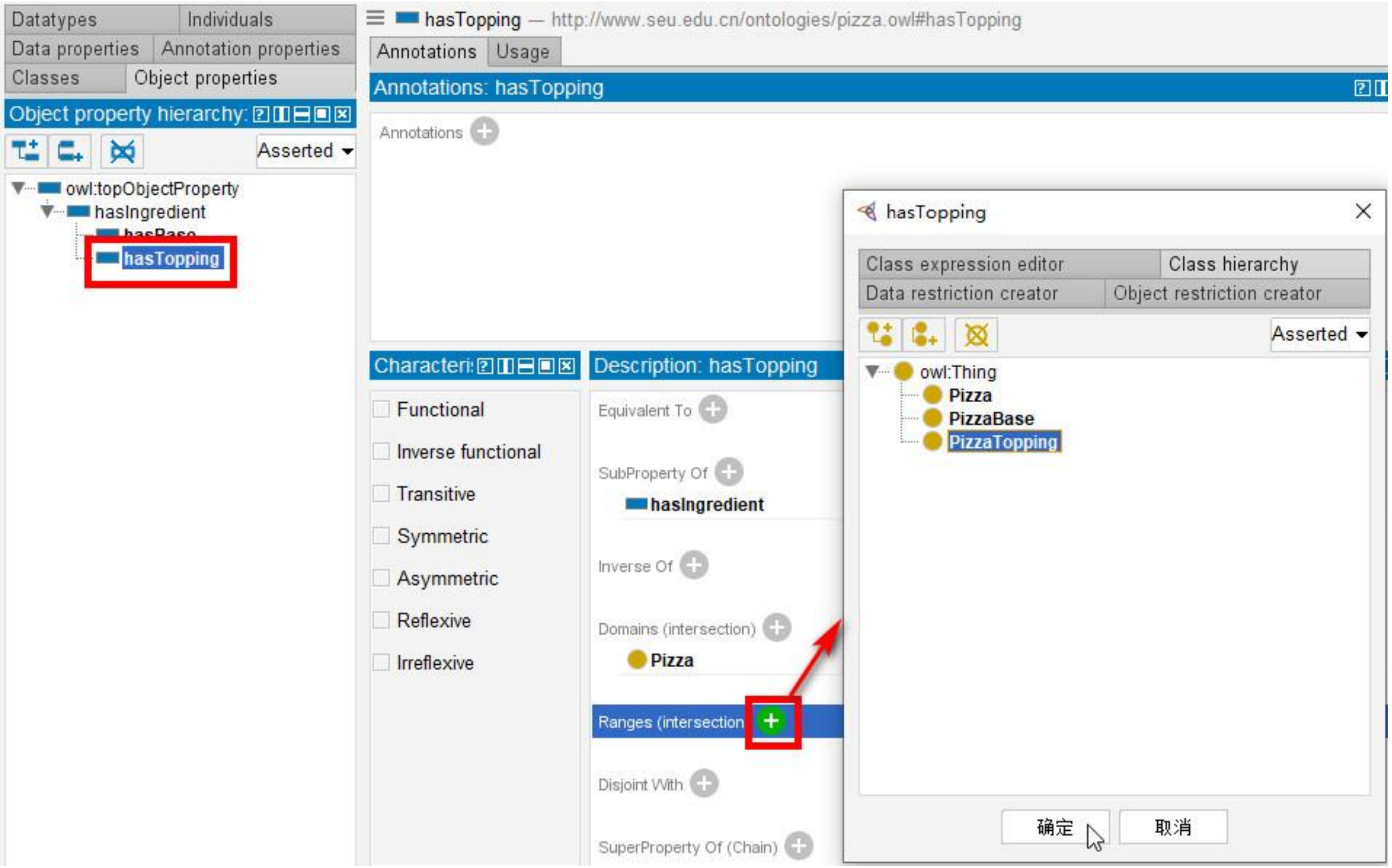
设置Object Property的domain

设置“hasTopping”的domain为“Pizza”



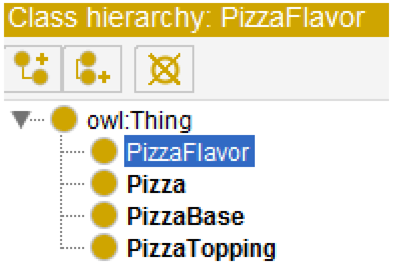
设置Object Property的range

设置“hasTopping”的range为“PizzaTopping”



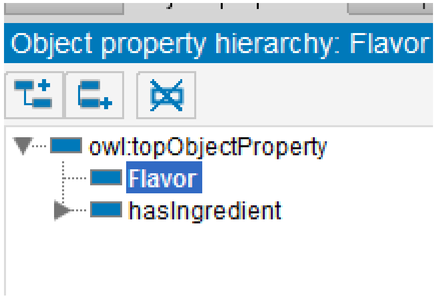
小练习

创建Class “PizzaFlavor”，
创建Object Property “Flavor”， domain为 “Pizza”，Range为 “PizzaFlavor”



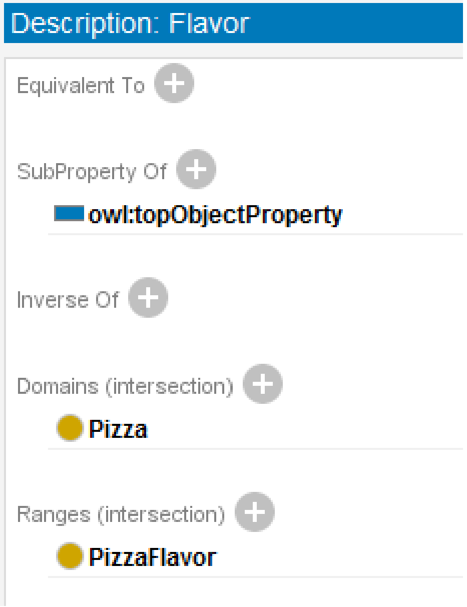
Class hierarchy: PizzaFlavor

owl:Thing
- PizzaFlavor
- Pizza
- PizzaBase
- PizzaTopping



Object property hierarchy: Flavor

owl:topObjectProperty
- Flavor
- hasIngredient



Description: Flavor

Equivalent To

SubProperty Of
owl:topObjectProperty

Inverse Of

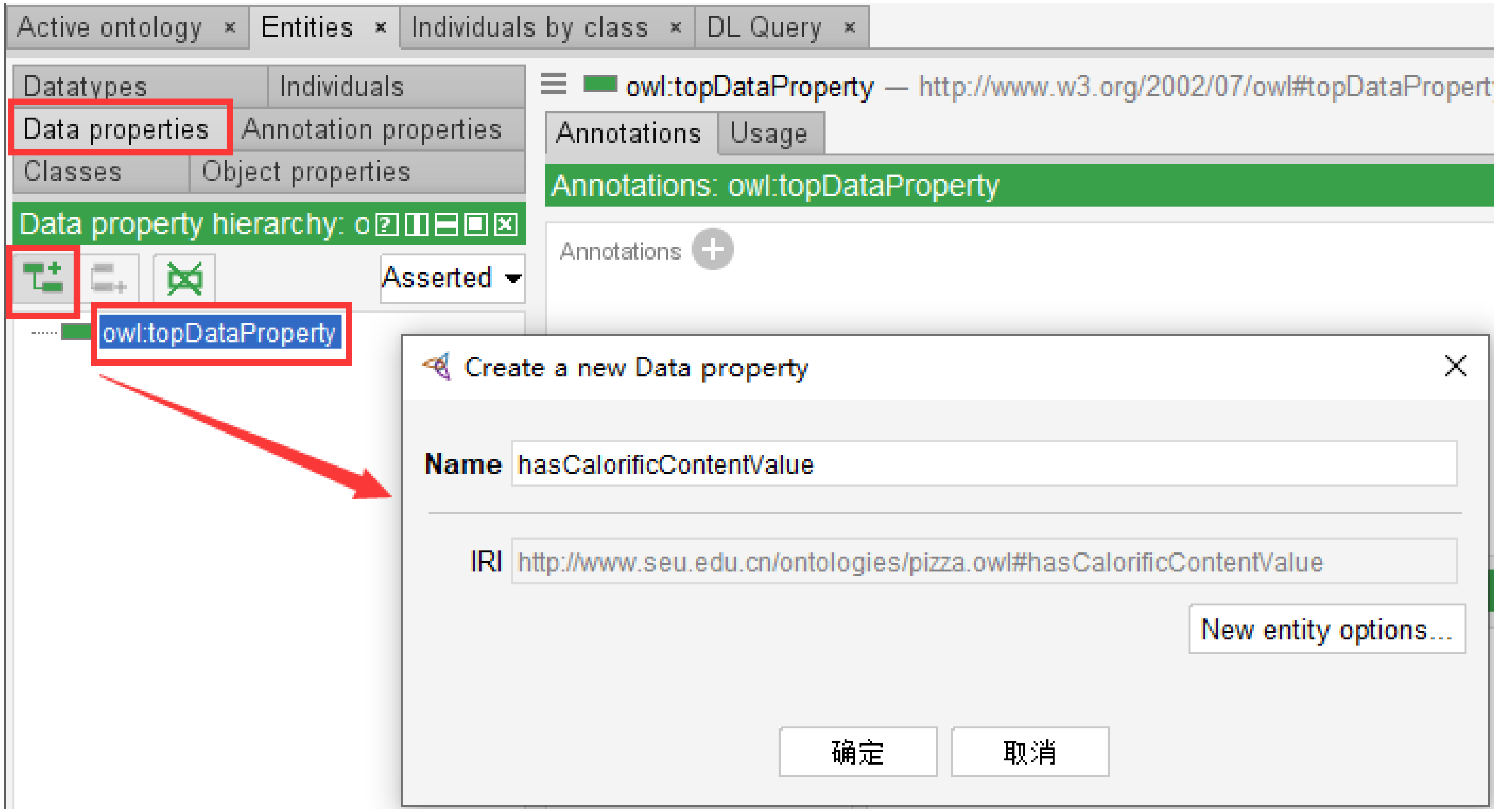
Domains (intersection)
Pizza

Ranges (intersection)
PizzaFlavor

完成创建后可删除

创建Data Property (the property between an individual and a literal)

选择 “Entities” → “Data properties”，创建 “owl:topDataProperty” 的subproperty “hasCalorificContentValue”

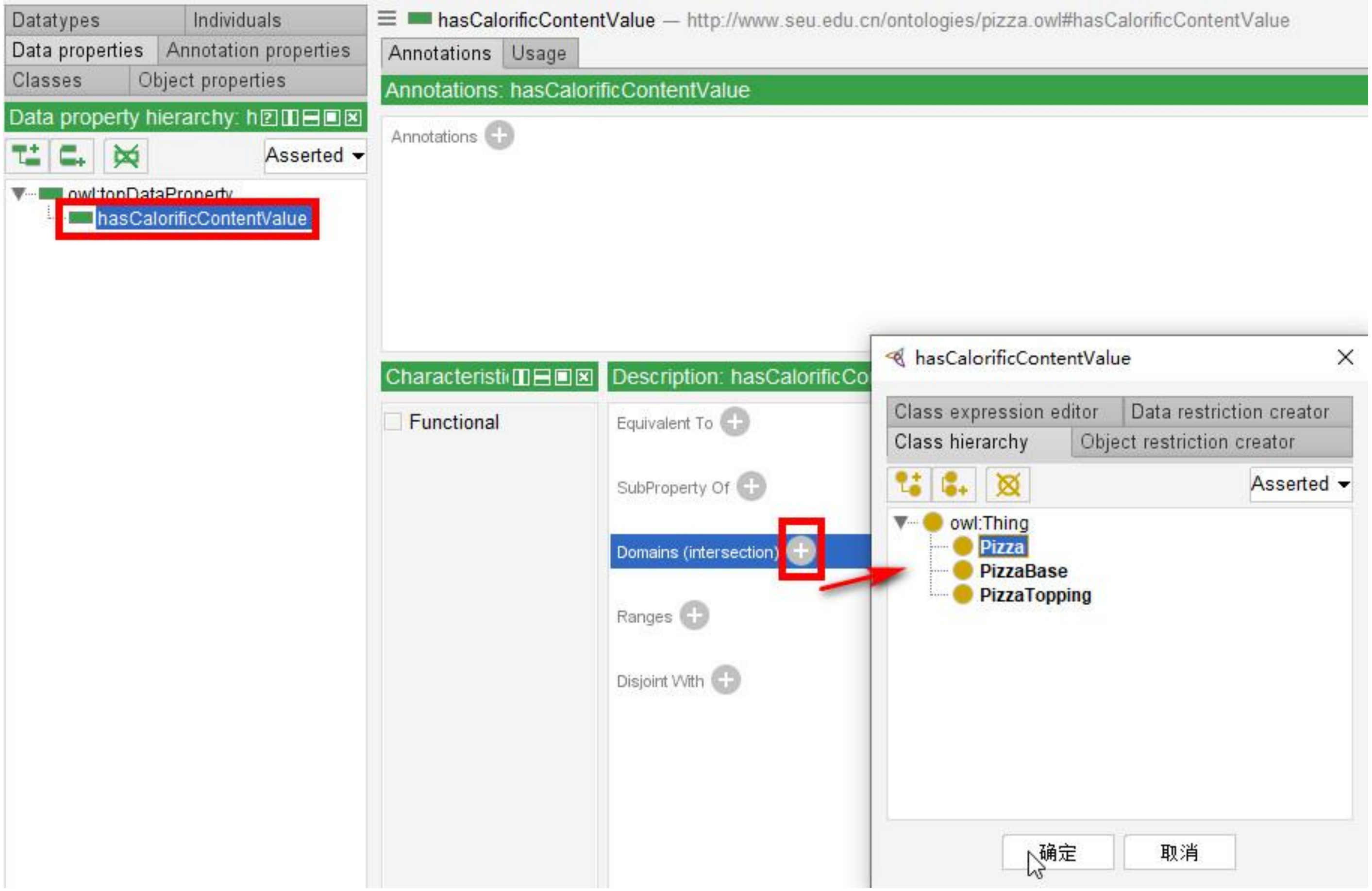


Name hasCalorificContentValue

IRI http://www.seu.edu.cn/ontologies/pizza.owl#hasCalorificContentValue

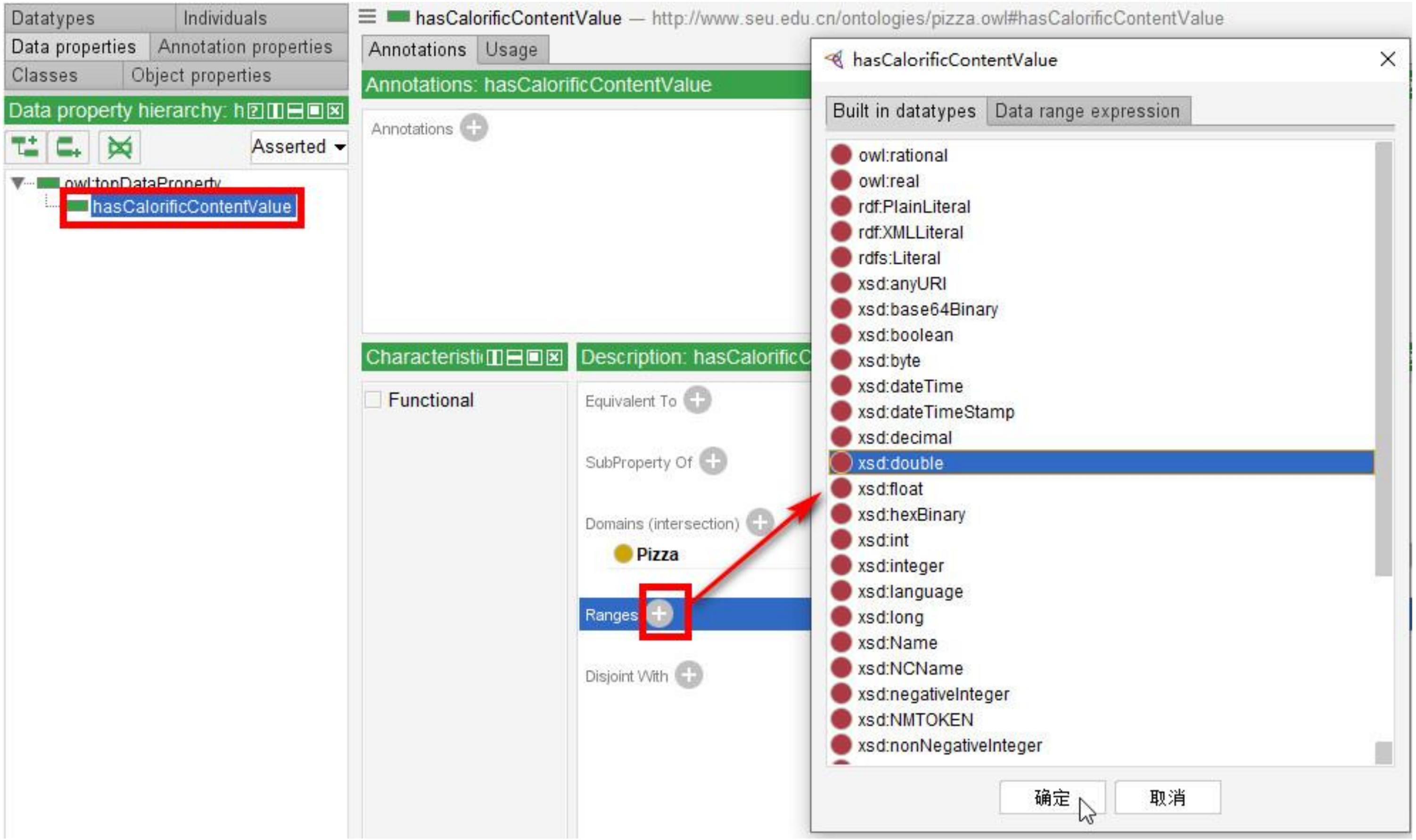
设置Data Property的domain

设置“hasCalorificContentValue”的domain为“Pizza”



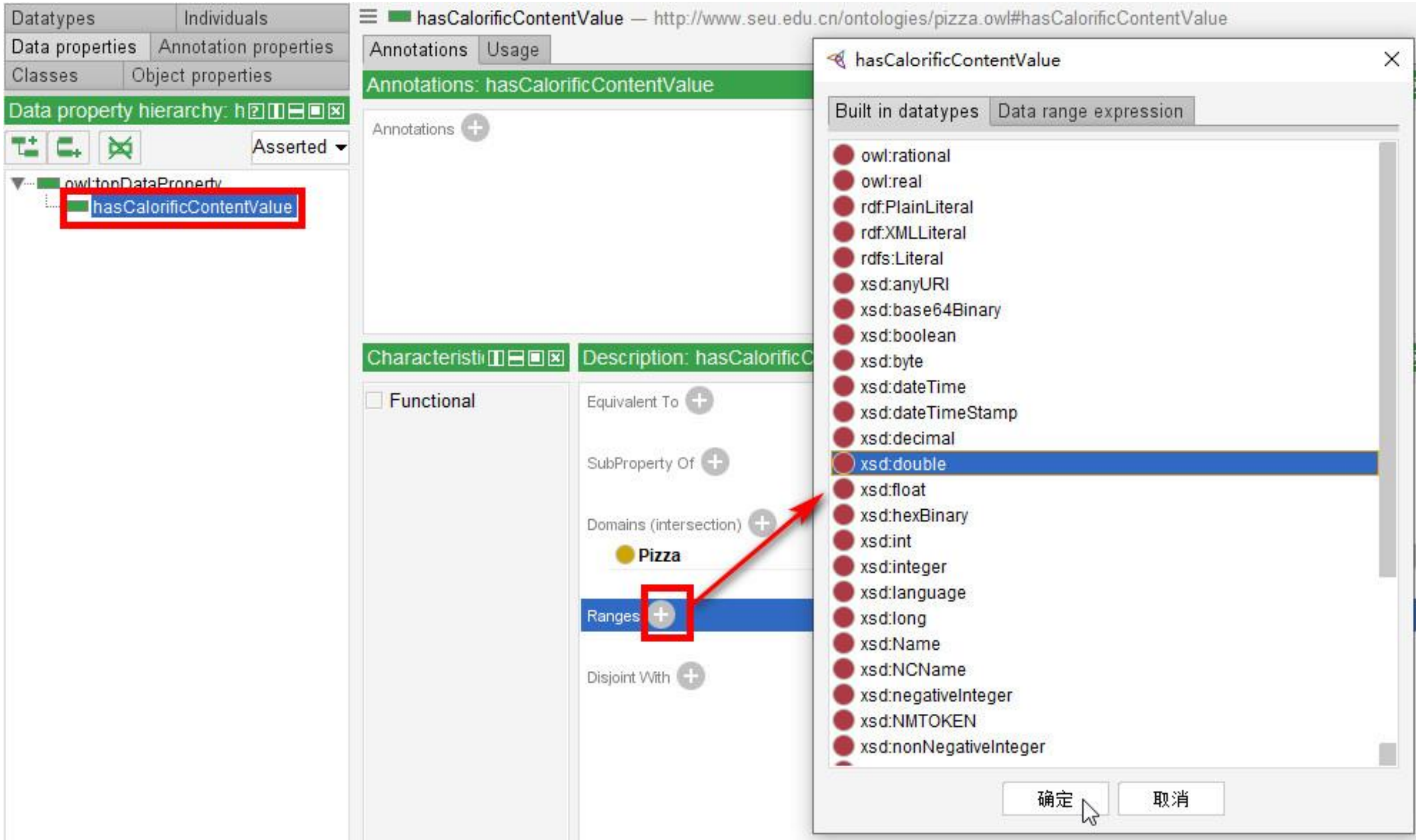
设置Data Property的range

设置 “hasCalorificContentValue” 的range为 “xsd:double”



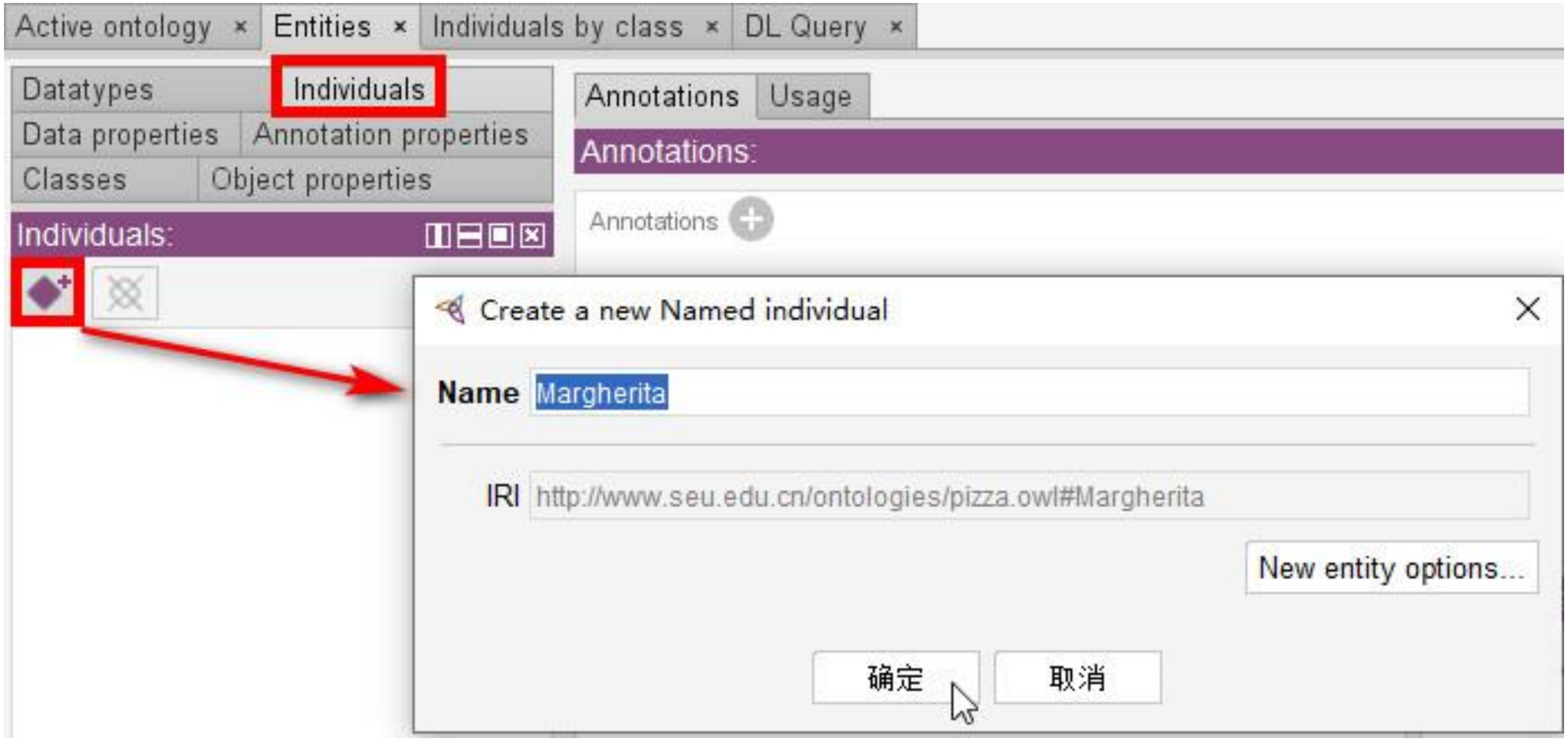
设置Data Property的range

设置“hasCalorificContentValue”的range为“xsd:double”



创建Individual

设置“Entities”→“Individuals”，创建Individual“Margherita”

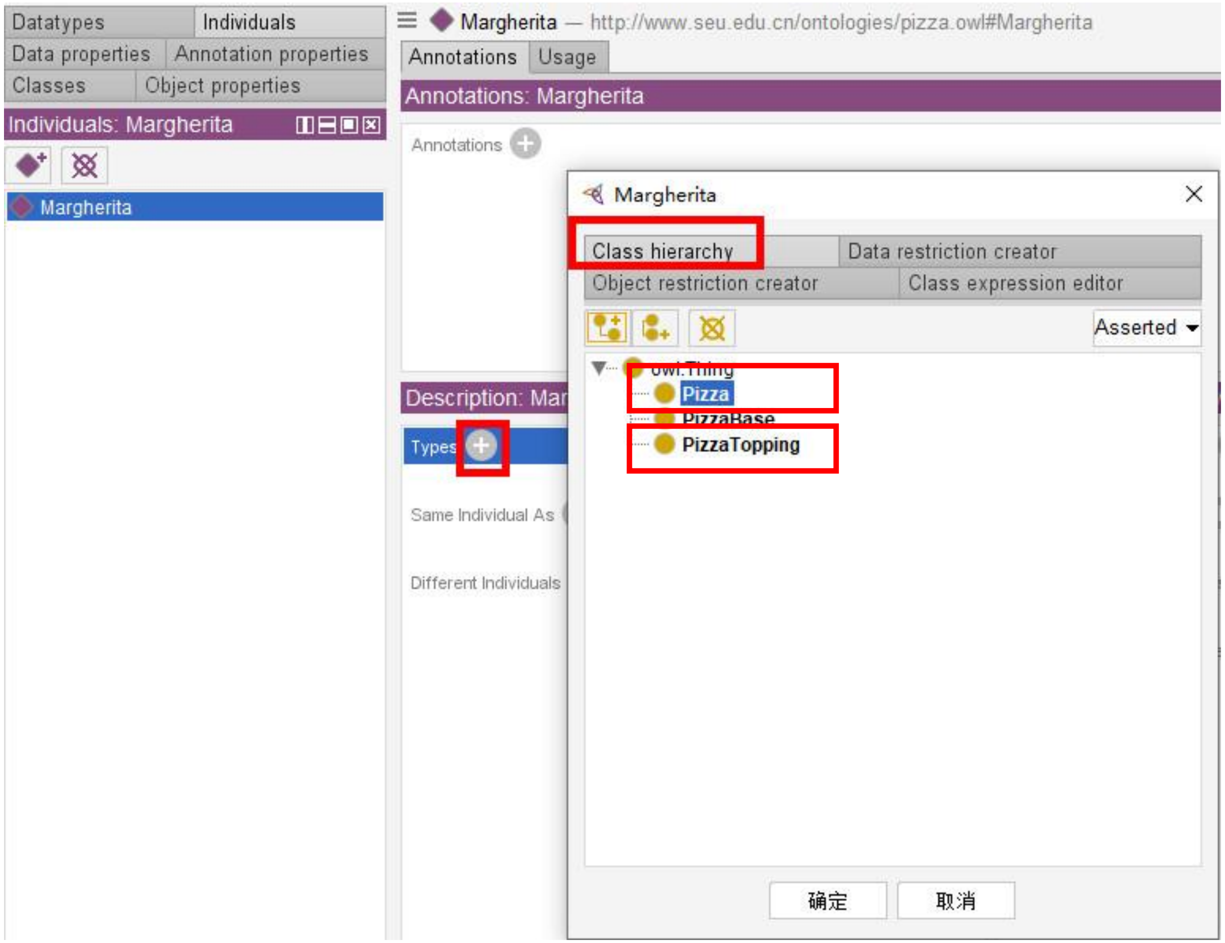


Name Margherita

IRI http://www.seu.edu.cn/ontologies/pizza.owl#Margherita

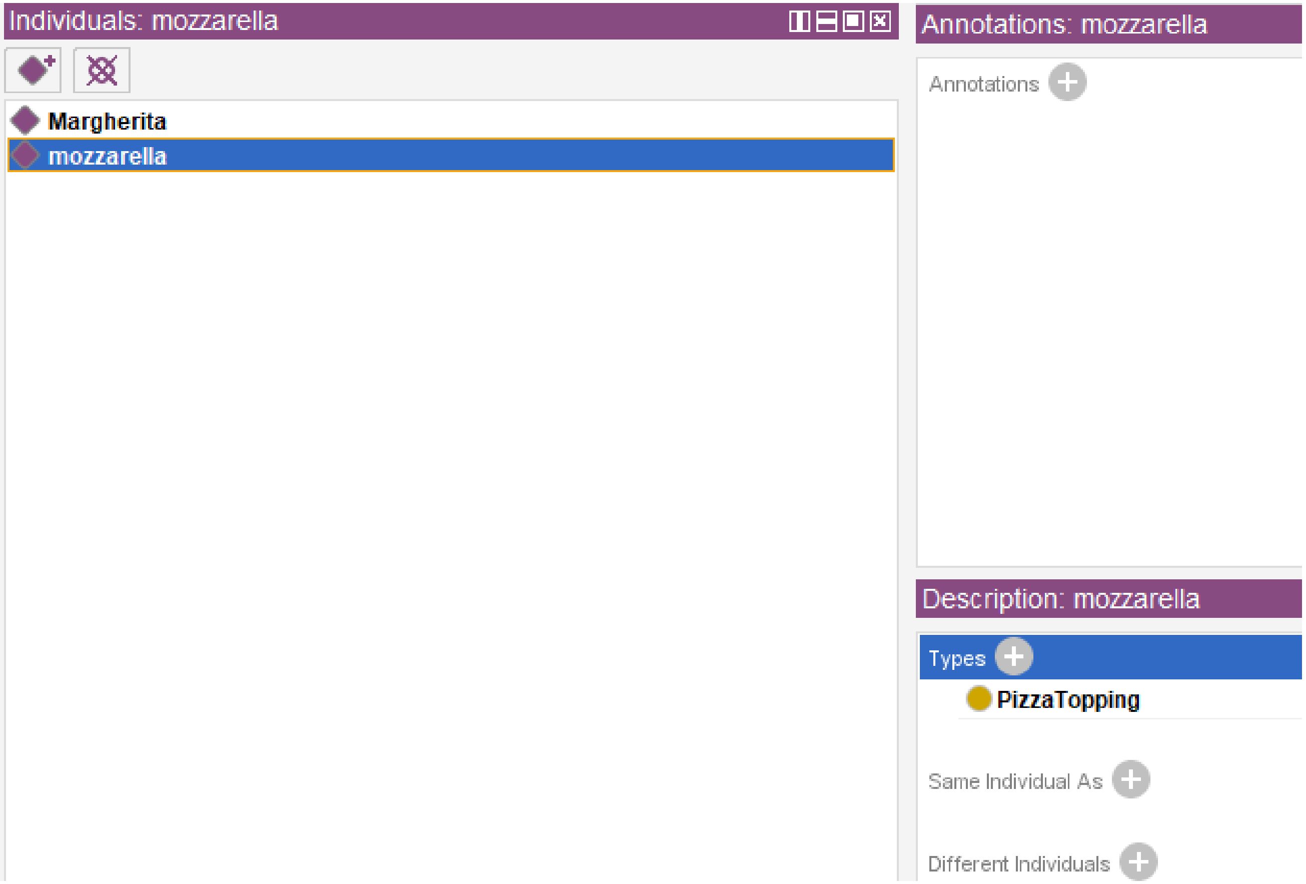
设置Individual Types

选择 “Margherita” 的Type为 “Pizza” 与 “PizzaTopping”



创建Individual

类似地，创建Individual “mozzarella”，设置其Type为“PizzaTopping”



Individuals: mozzarella

- Margherita
- mozzarella

Annotations: mozzarella

Annotations

Description: mozzarella

Types

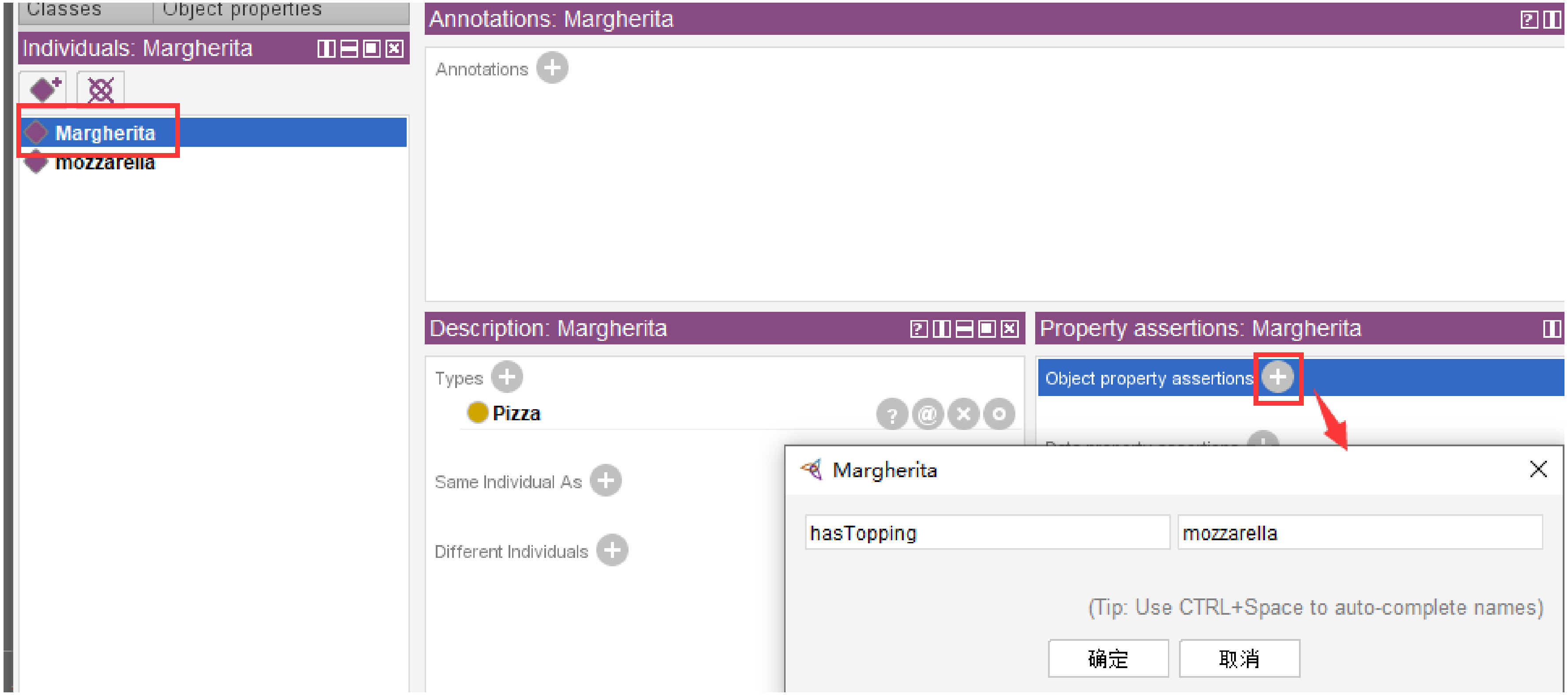
- PizzaTopping

Same Individual As

Different Individuals

创建关于Individual的面向object property的assertion

“Margherita”　“hasTopping”　“mozzarella”

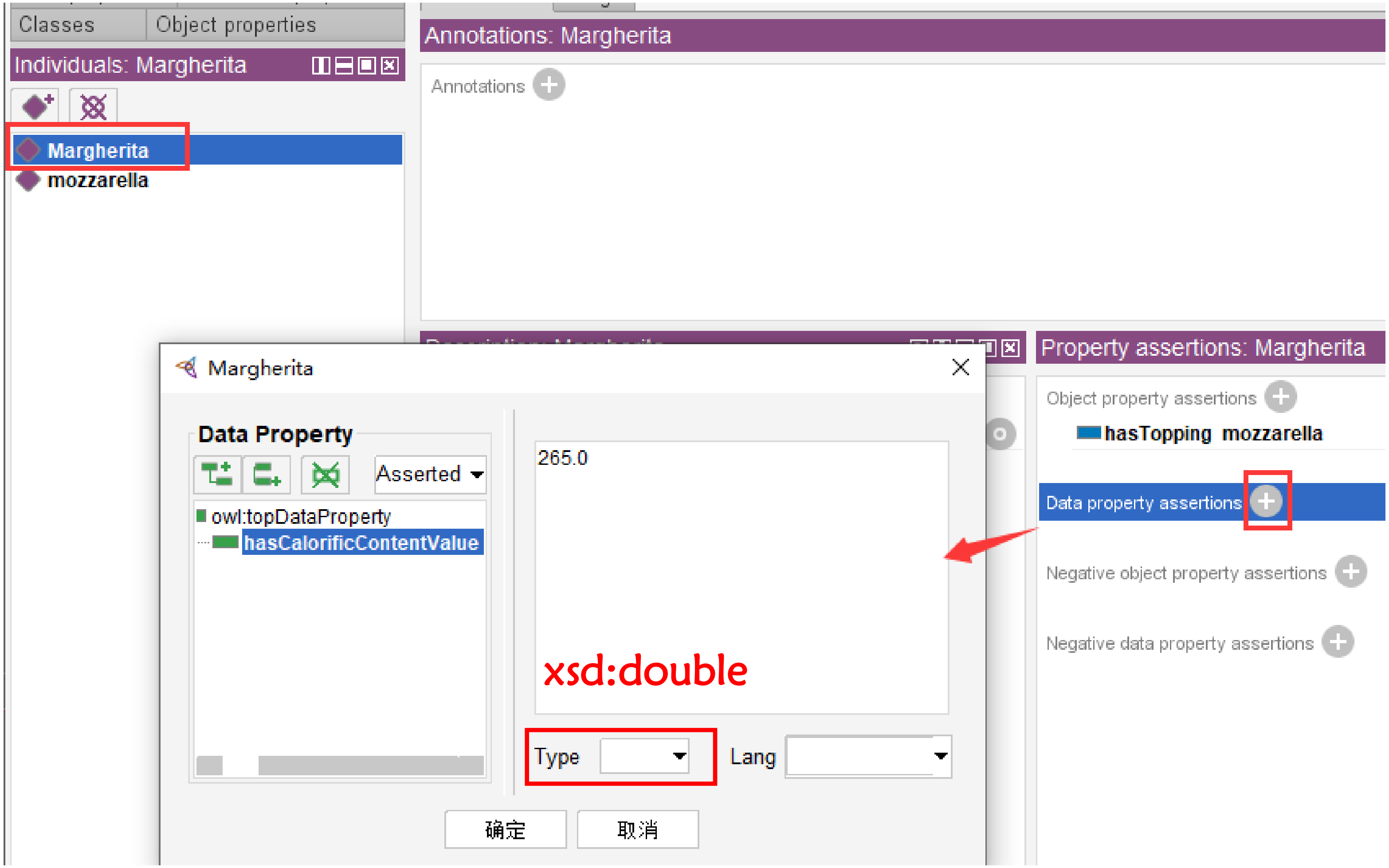


hasTopping　mozzarella

(Tip: Use CTRL+Space to auto-complete names)

创建关于Individual的面向data property的assertion

“Margherita” “hasCalorificContentValue” “265.0”



Classes | Object properties

Individuals: Margherita

Margherita
mozzarella

Annotations: Margherita

Annotations

Property assertions: Margherita

Object property assertions

hasTopping mozzarella

Data property assertions

Negative object property assertions

Negative data property assertions

Margherita

Data Property

Asserted

owl:topDataProperty
hasCalorificContentValue

265.0

xsd:double

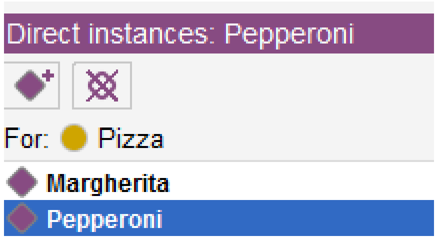
Type

Lang

确定 取消

小练习

“Pepperoni”　“hasCalorificContentValue”　“185.2”

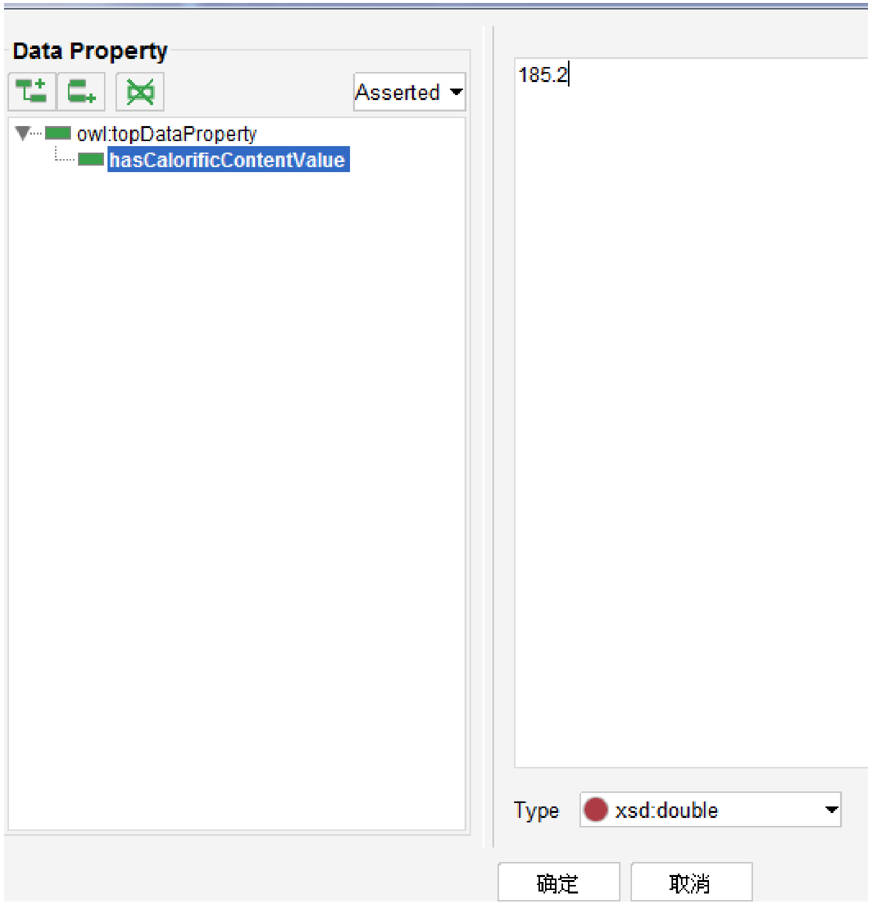


Direct instances: Pepperoni

For: Pizza

Margherita

Pepperoni



Data Property

owl:topDataProperty

hasCalorificContentValue

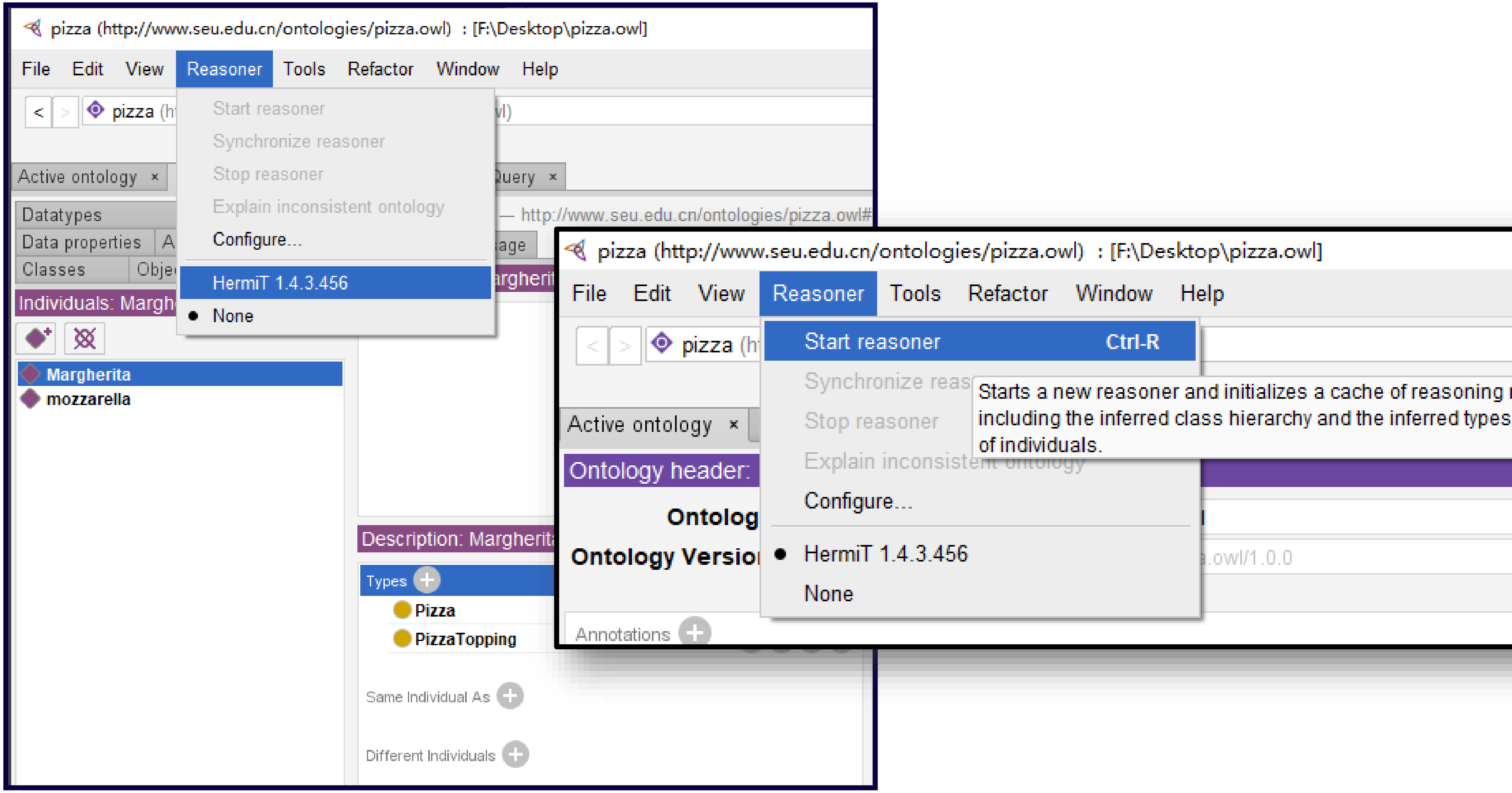
185.2

Type: xsd:double

完成创建后可删除

推理

先选择“HermiT 1.4.3.456”，再选择“Start reasoner”

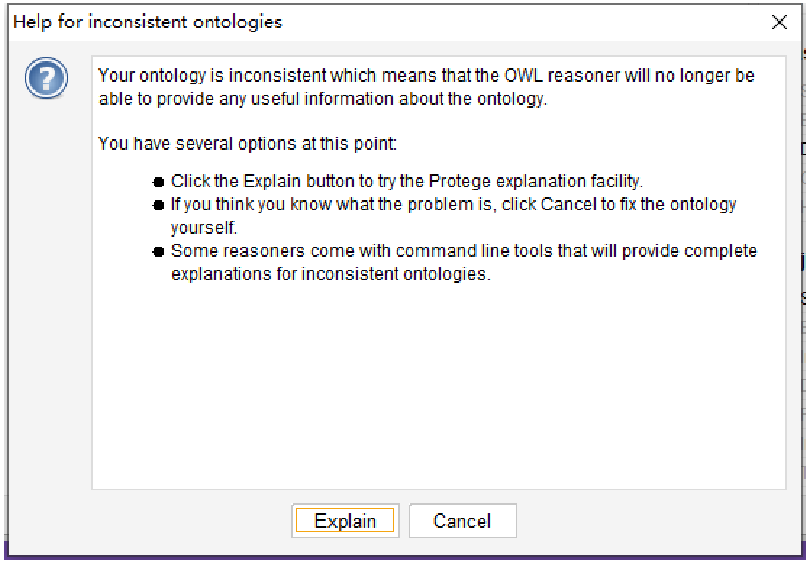


Starts a new reasoner and initializes a cache of reasoning including the inferred class hierarchy and the inferred types of individuals.

推理

Inconsistent Ontology

选择Explain

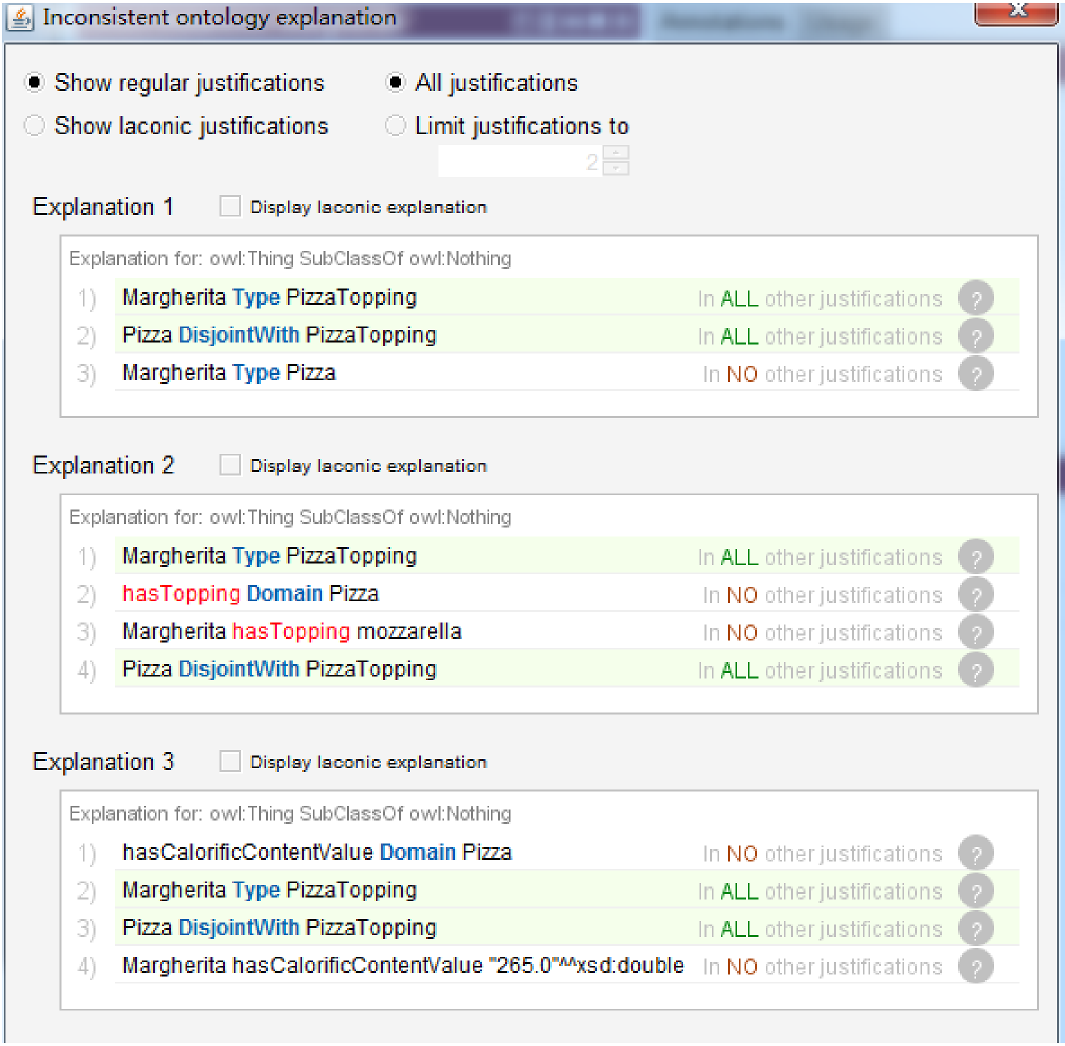


Help for inconsistent ontologies

Your ontology is inconsistent which means that the OWL reasoner will no longer be able to provide any useful information about the ontology.

You have several options at this point:

- Click the Explain button to try the Protege explanation facility.
- If you think you know what the problem is, click Cancel to fix the ontology yourself.
- Some reasoners come with command line tools that will provide complete explanations for inconsistent ontologies.



Inconsistent ontology explanation

● Show regular justifications ● All justifications
○ Show laconic justifications ○ Limit justifications to 2

Explanation 1 □ Display laconic explanation

Explanation for: owl:Thing SubClassOf owl:Nothing

1) Margherita Type PizzaTopping In ALL other justifications
2) Pizza DisjointWith PizzaTopping In ALL other justifications
3) Margherita Type Pizza In NO other justifications

Explanation 2 □ Display laconic explanation

Explanation for: owl:Thing SubClassOf owl:Nothing

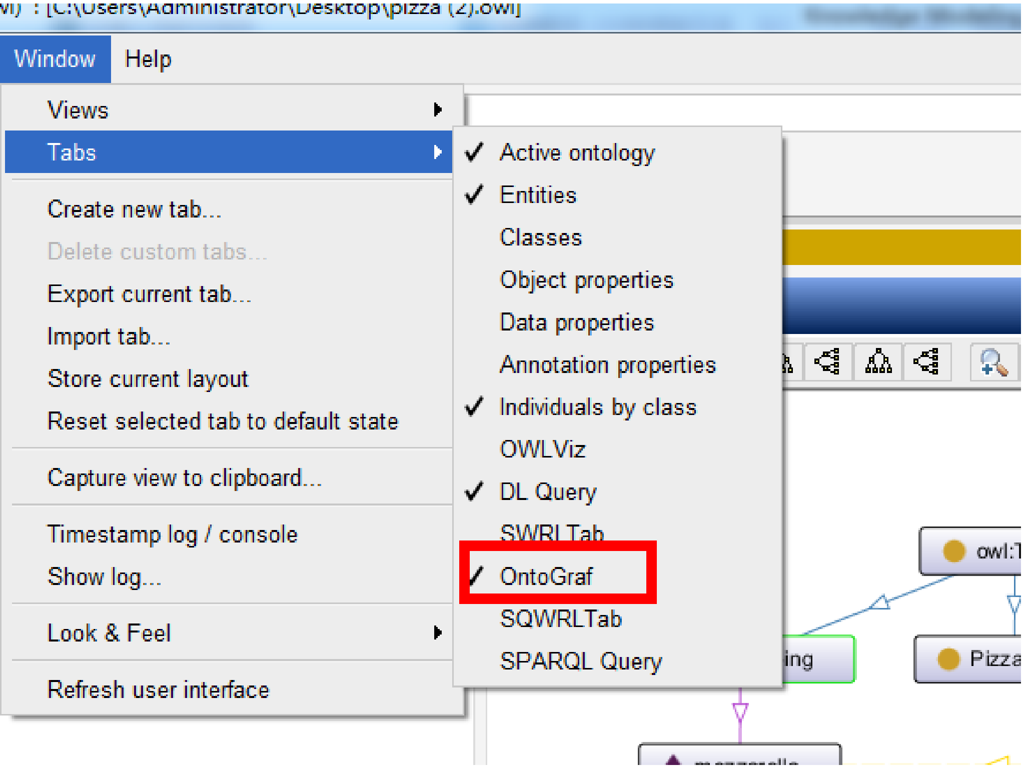
1) Margherita Type PizzaTopping In ALL other justifications
2) hasTopping Domain Pizza In NO other justifications
3) Margherita hasTopping mozzarella In NO other justifications
4) Pizza DisjointWith PizzaTopping In ALL other justifications

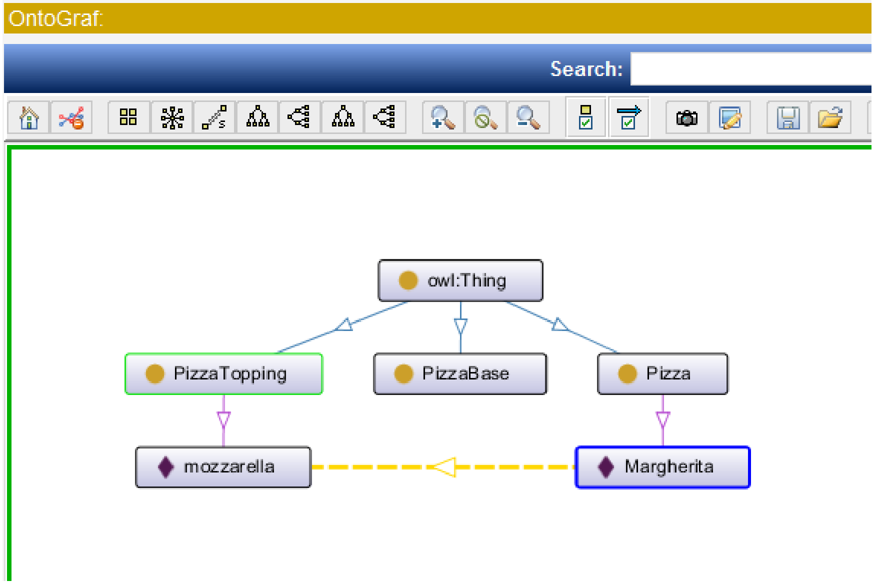
Explanation 3 □ Display laconic explanation

Explanation for: owl:Thing SubClassOf owl:Nothing

1) hasCalorificContentValue Domain Pizza In NO other justifications
2) Margherita Type PizzaTopping In ALL other justifications
3) Pizza DisjointWith PizzaTopping In ALL other justifications
4) Margherita hasCalorificContentValue "265.0"^^xsd:double In NO other justifications

可视化


wl) : [C:\Users\Administrator\Desktop\pizza (2).owl]
Window
Help
Views
Tabs
Create new tab...
Delete custom tabs...
Export current tab...
Import tab...
Store current layout
Reset selected tab to default state
Capture view to clipboard...
Timestamp log / console
Show log...
Look & Feel
Refresh user interface
✓ Active ontology
✓ Entities
Classes
Object properties
Data properties
Annotation properties
✓ Individuals by class
OWLViz
✓ DL Query
SWRLTab
✓ OntoGraf
SQWRLTab
SPARQL Query
owl:T
ing
Pizza
mozzarella


OntoGraf:
Search:
owl:Thing
PizzaTopping
PizzaBase
Pizza
mozzarella
Margherita

三、课堂作业

创建一个包含axioms和assertions的consistent ontology（任选感兴趣的领域），要求：

1）包含Class、Individual、Object Property、Data Property
2）定义Property Domain、Range、Individual Type
3）最终以Turtle形式导出，三元组数量不低于25条