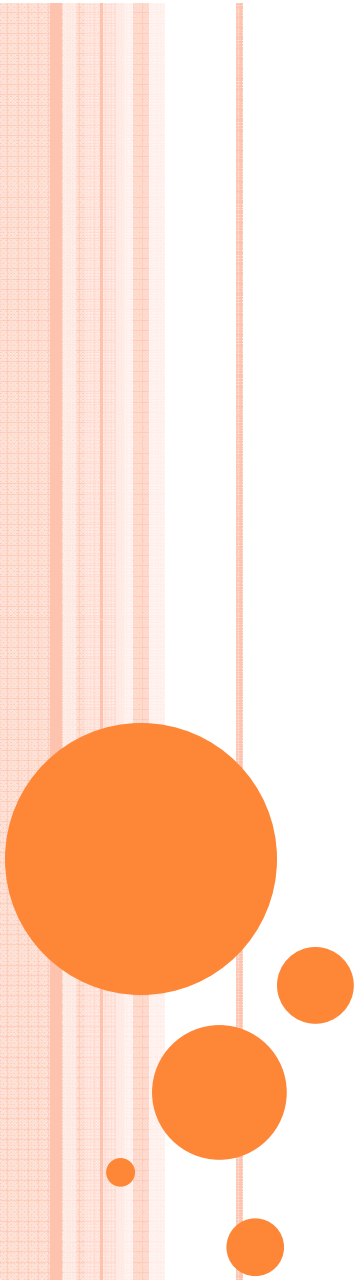


COGUI TUTORIAL

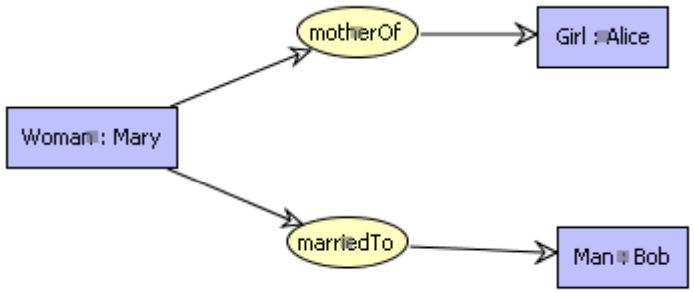
Facts

Fact graphs

A BG Fact is composed of:

- The concept nodes representing entities labeled by
  - *Concept types* (vocabulary) and
  - Either the *generic marker* (*) or an *individual marker*
- The relation nodes representing relationships between these entities labeled by *relation types* (vocabulary)

EXAMPLE



- There are entities (represented by rectangles): Mary, who is a Woman, Alice who is a Girl and Bob who is a Man
- There are relations (represented by ovals) between the entities: a relation asserting that Mary is the motherOf Alice and a relation asserting that Mary is marriedTo Bob.

Summing and Normalizing BGs

- The sum of two BGs comes down to summing two graphs (the resulting graph has the union set of vertices and edges)
- Two concept nodes having the same individual marker represent the same entity and then can be merged into one concept (normalization):
  - A BG is called normal if there is at most one individual concept with a given marker

THE BG MODEL - SEMANTICS

- Vocabulary:
  - A predicate is assigned to each type (unary predicate to a concept type and a k-ary predicate to a k-ary relation type)
  - A constant is assigned to each individual marker
  - Translating the specialization relation:

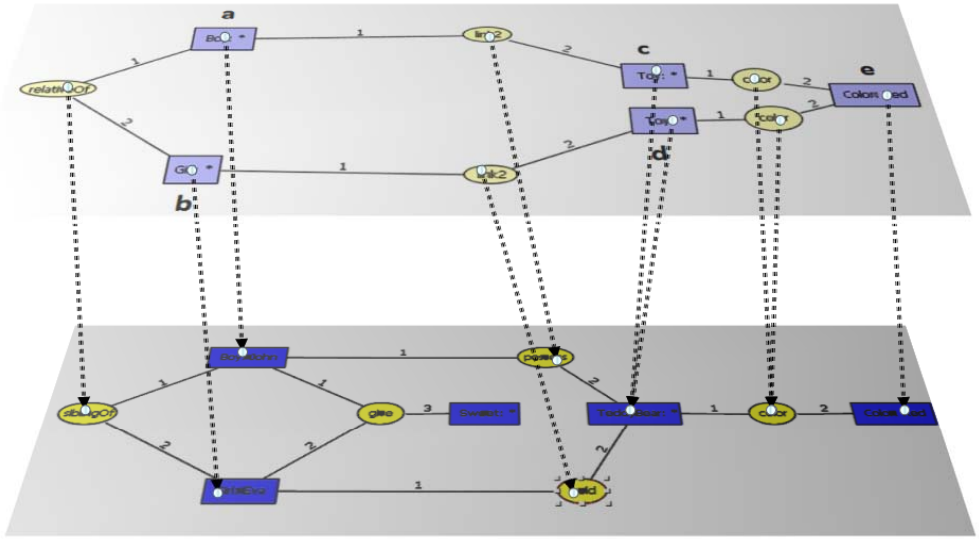
$$\forall x(Girl(x) \rightarrow Child(x)), \forall x \forall y(sisterOf(x, y) \rightarrow relativeOf(x, y))$$

- Facts being assigned the existentially closed formulae:

$$\exists x \exists y(Girl(x) \wedge Boy(y) \wedge sisterOf(x, y))$$

HOMOMORPHISM ("PROJECTION")

- A homomorphism from a BG G to a BG H is a mapping from the nodes of G to the nodes of H, which preserves the relationships between the entities of G and may specialize the labels of entities and relationships.



HOMOMORPHISM

- Sound and complete with respect to logical deduction
- If there is a homomorphism from G to H we say that H entails G
- Basic Conceptual Graphs correspond to the existential, positive and conjunctive fragment of **First Order Logic**

Query Answering

- A knowledge base composed of a vocabulary and **set of BGs**
- A query: itself a **BG**
- Elements answering the query: elements of the knowledge base that entail the query:
  - Yes/No question: Is the knowledge represented by the query asserted by the Knowledge Base?
  - Pattern allowing to extract knowledge from the Knowledge Base: each homomorphism from the query to the knowledge base defines an answer to the query

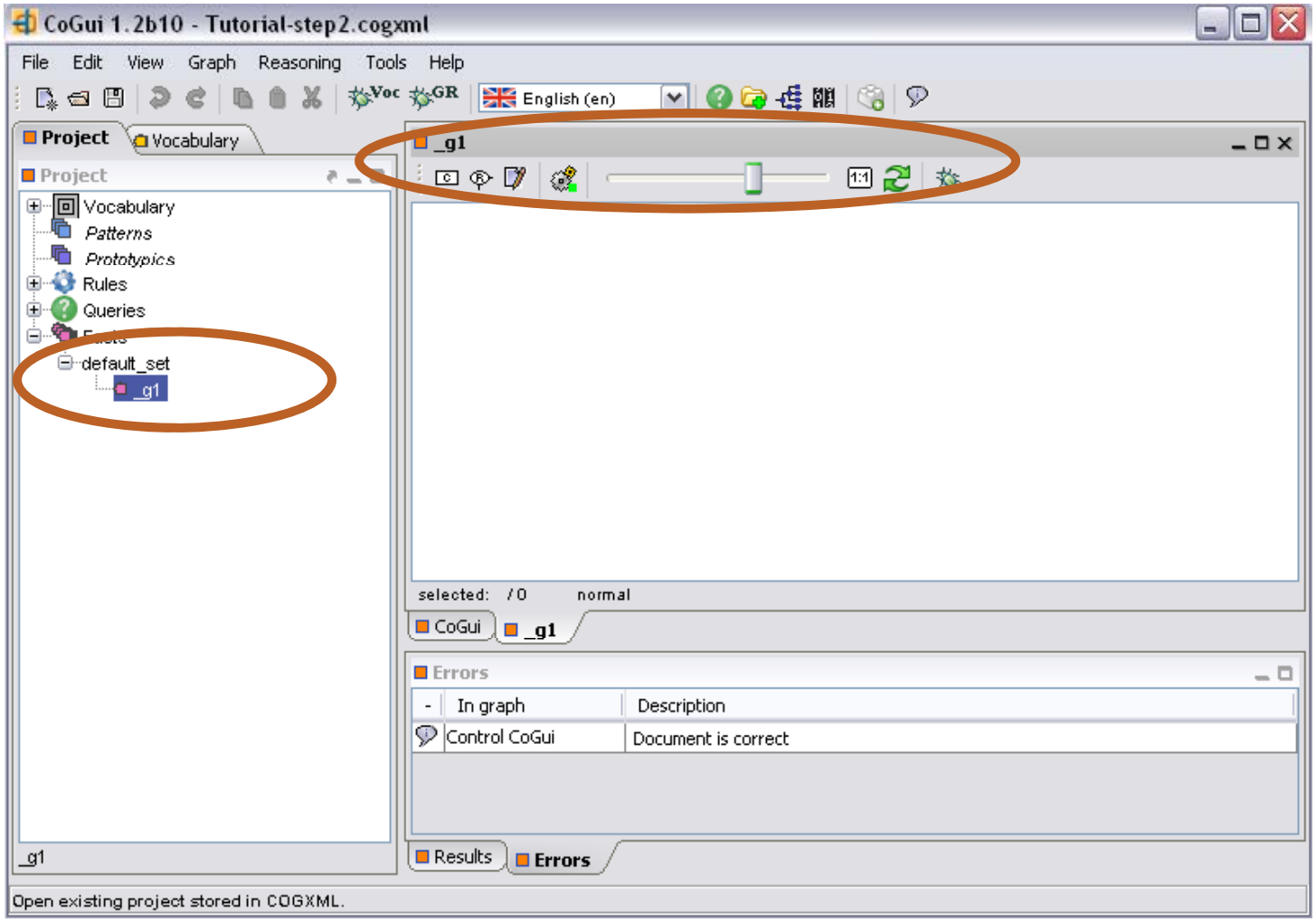
IRREDUNDANT GRAPHS

- Two graphs G and H are hom-equivalent if there is a hom from G to H and a hom from H to G
- A BG is called redundant if it is hom-equivalent to one f its strict subgraphs. Otherwise it is called irredundant.

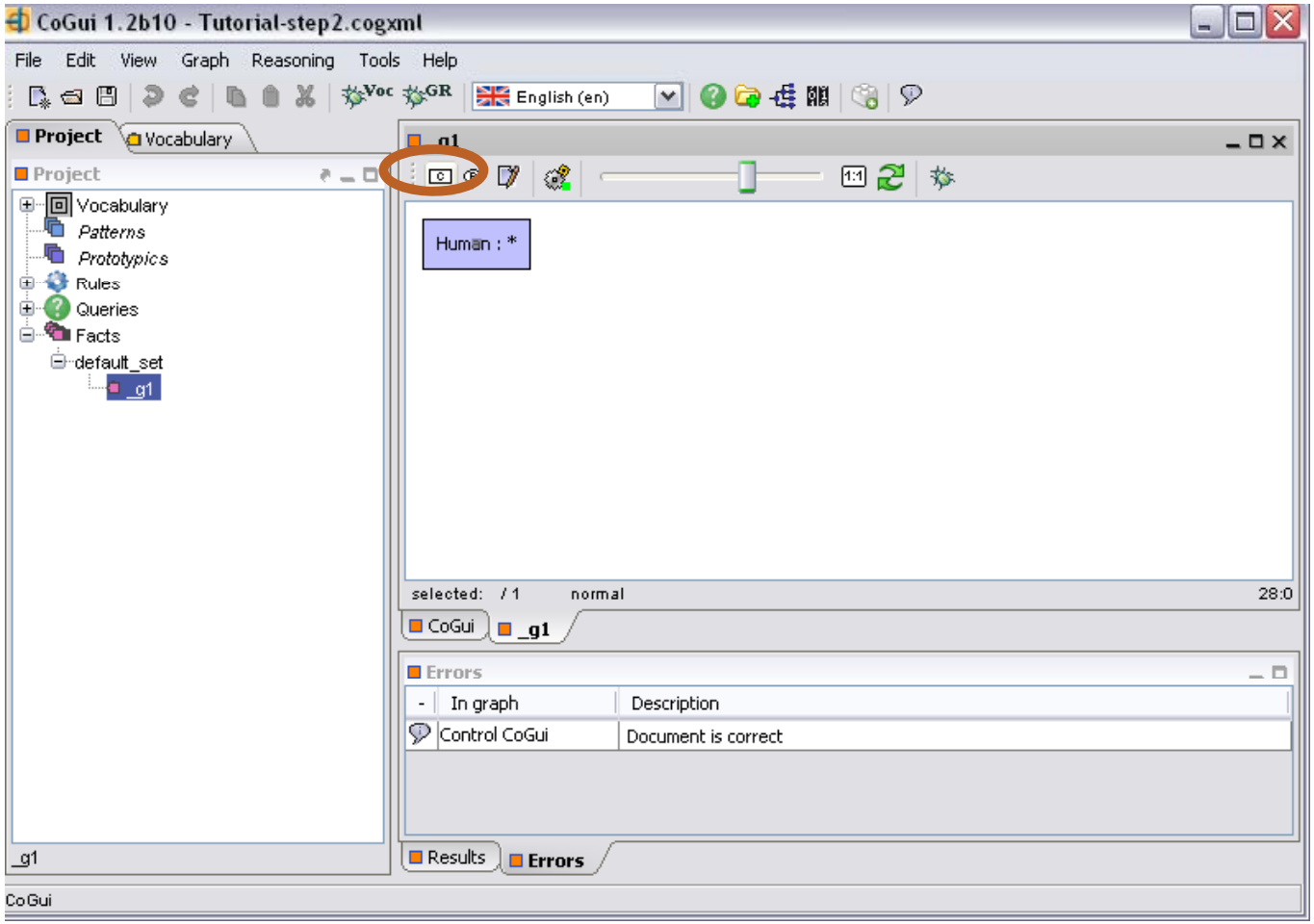
Editing Fact graphs in Cogui

Open the tutorial-step2.cogxml file and select facts under project

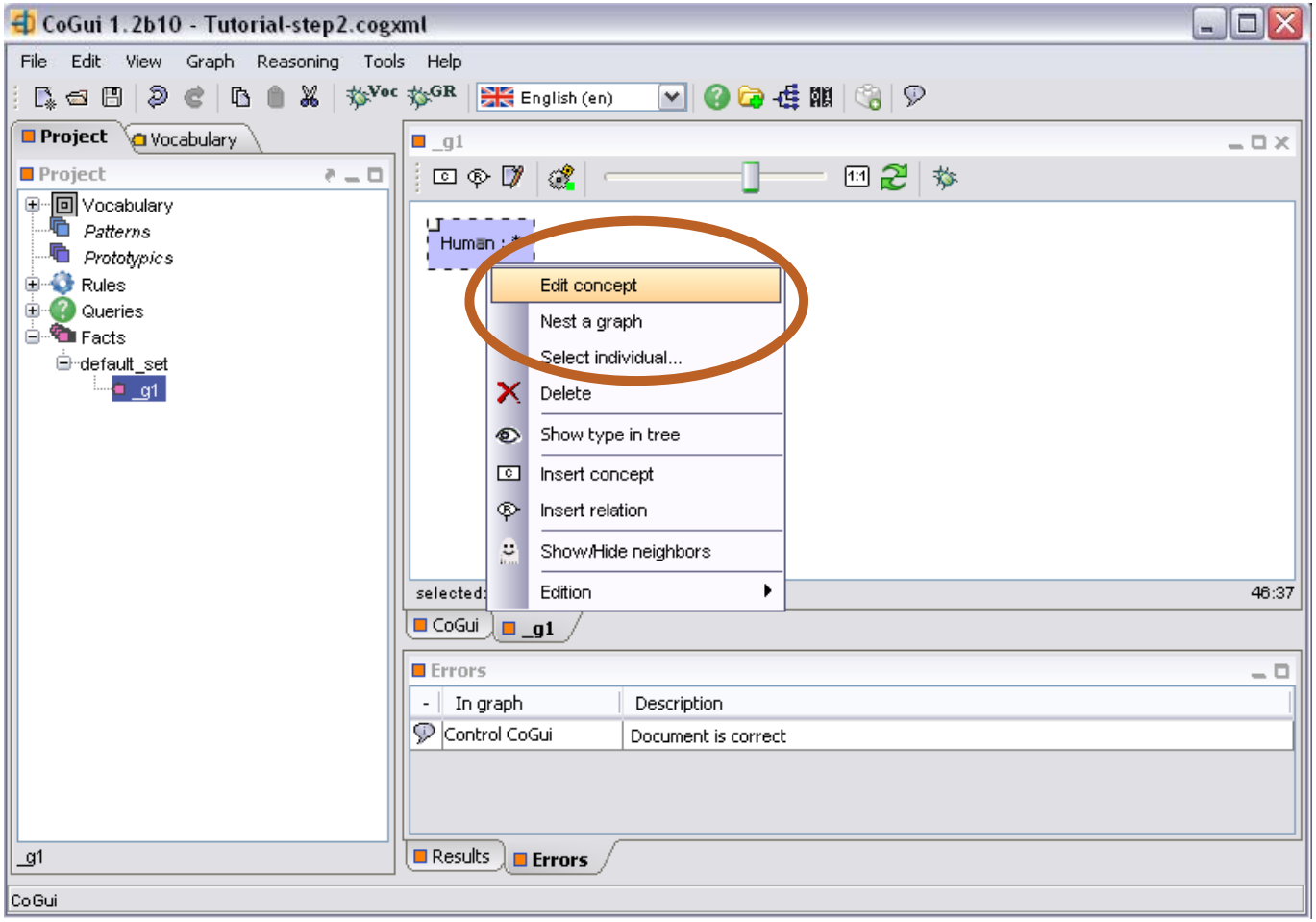
UNDER DEFAULT_SET OF FACTS THERE IS ALREADY A _G1 FACT THAT CAN BE EDITED



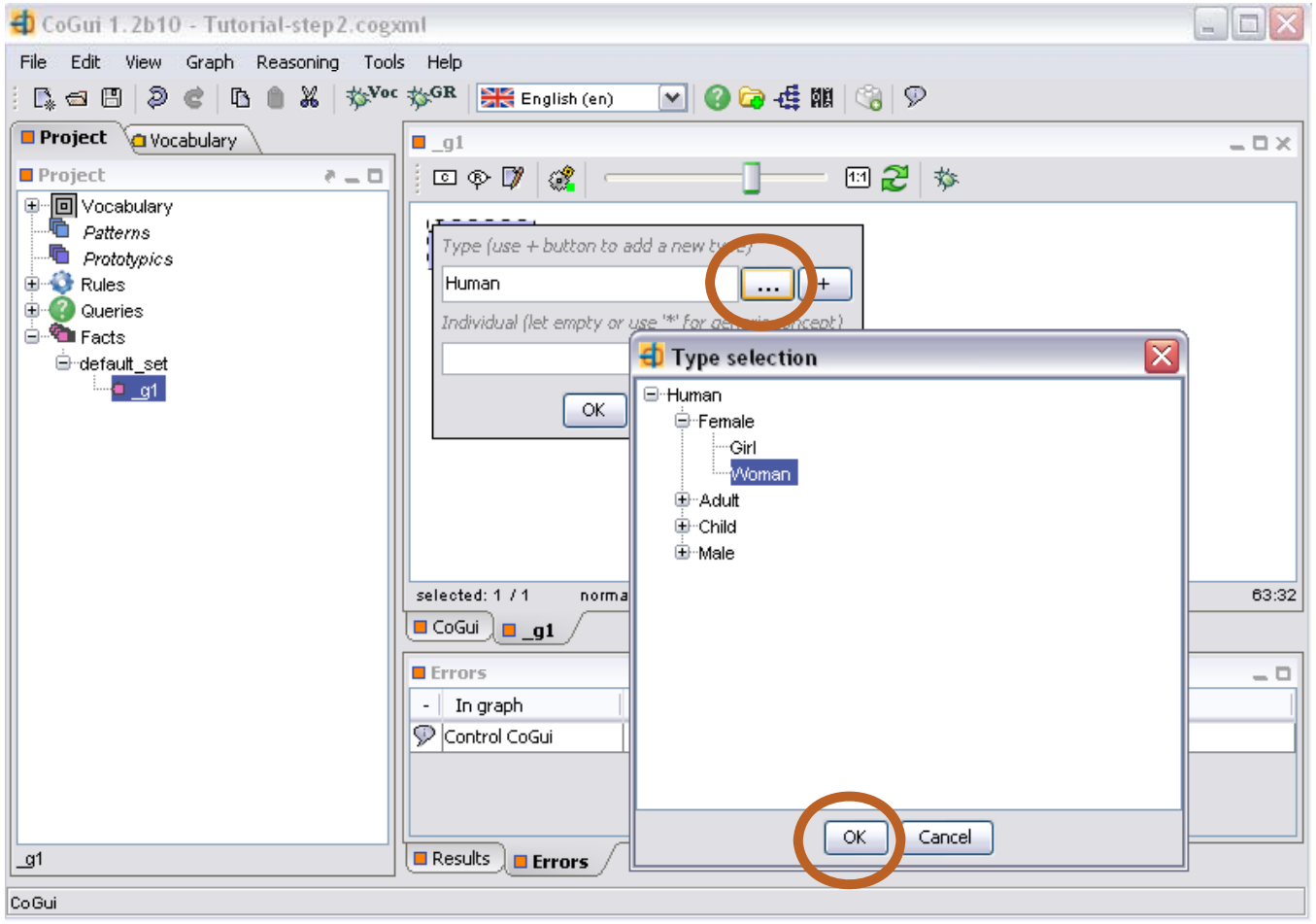
To insert a concept node in a fact use the graph editor and click on concept



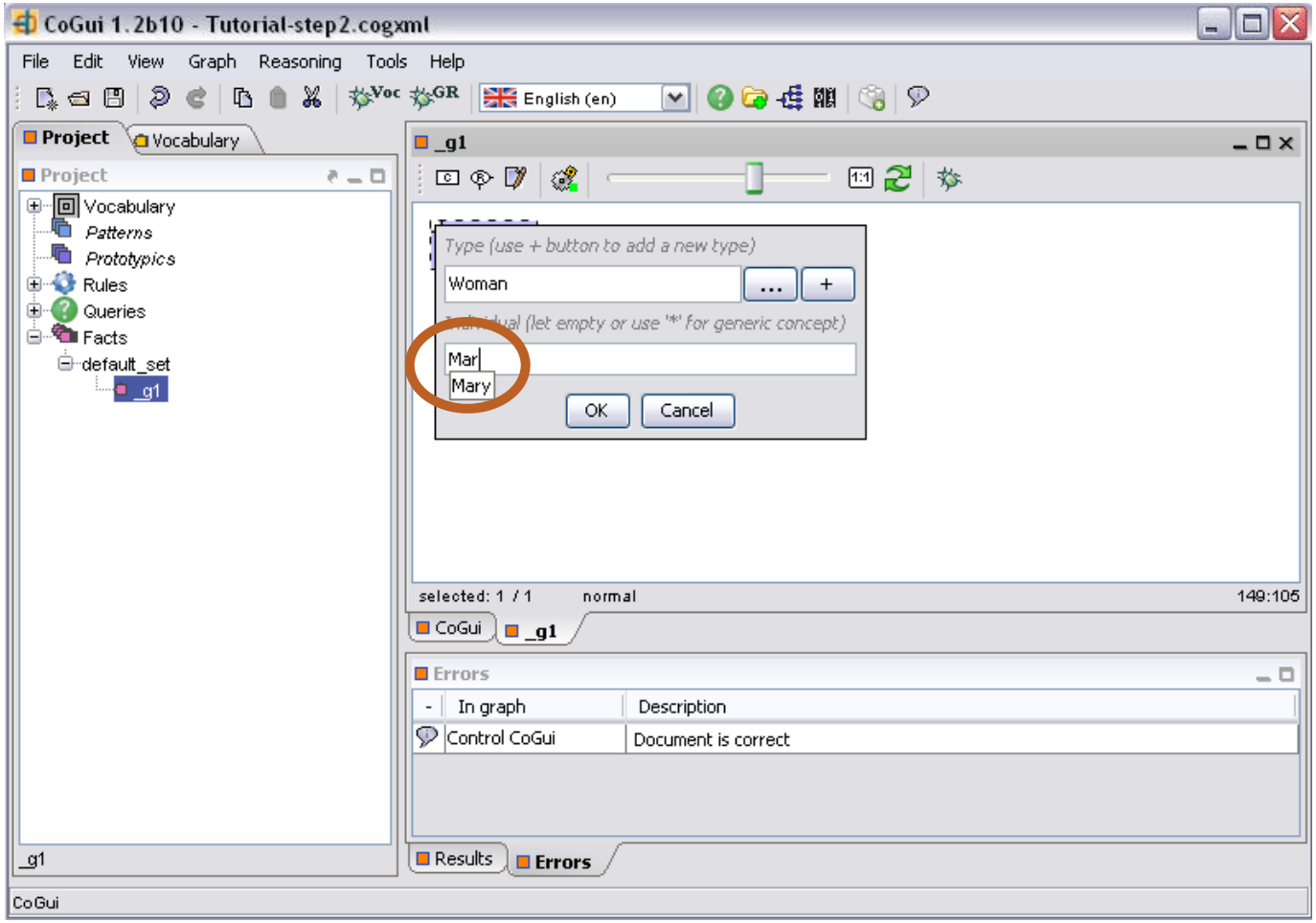
THE TYPE OF A ADDED CONCEPT IS BY DEFAULT THE UPPER MOST TYPE IN THE HIERARCHY – TO MODIFY RIGHT CLICK AND EDIT



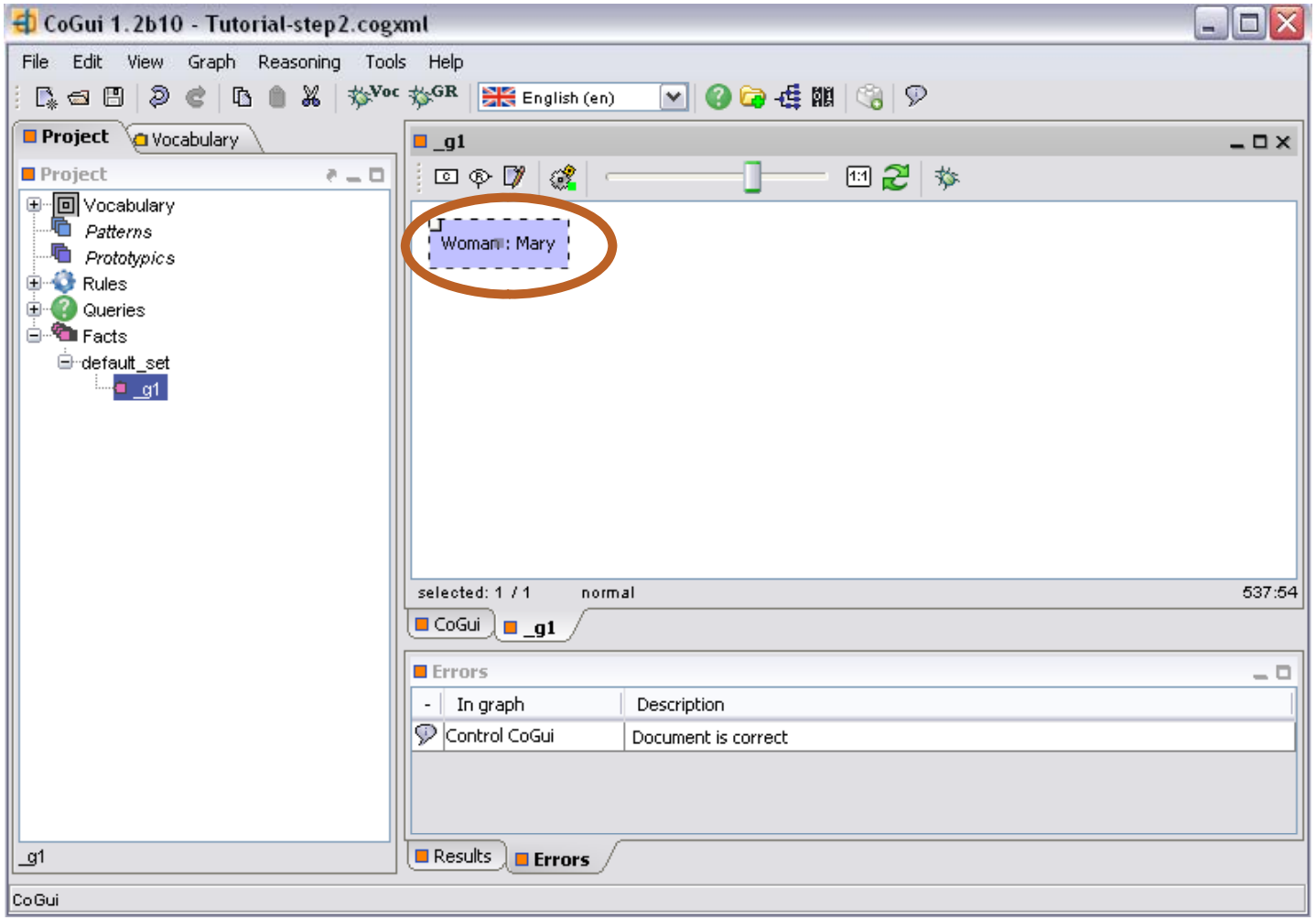
VIEW AND SELECT THE APPROPRIATE CONCEPT TYPE IN THE HIERARCHY



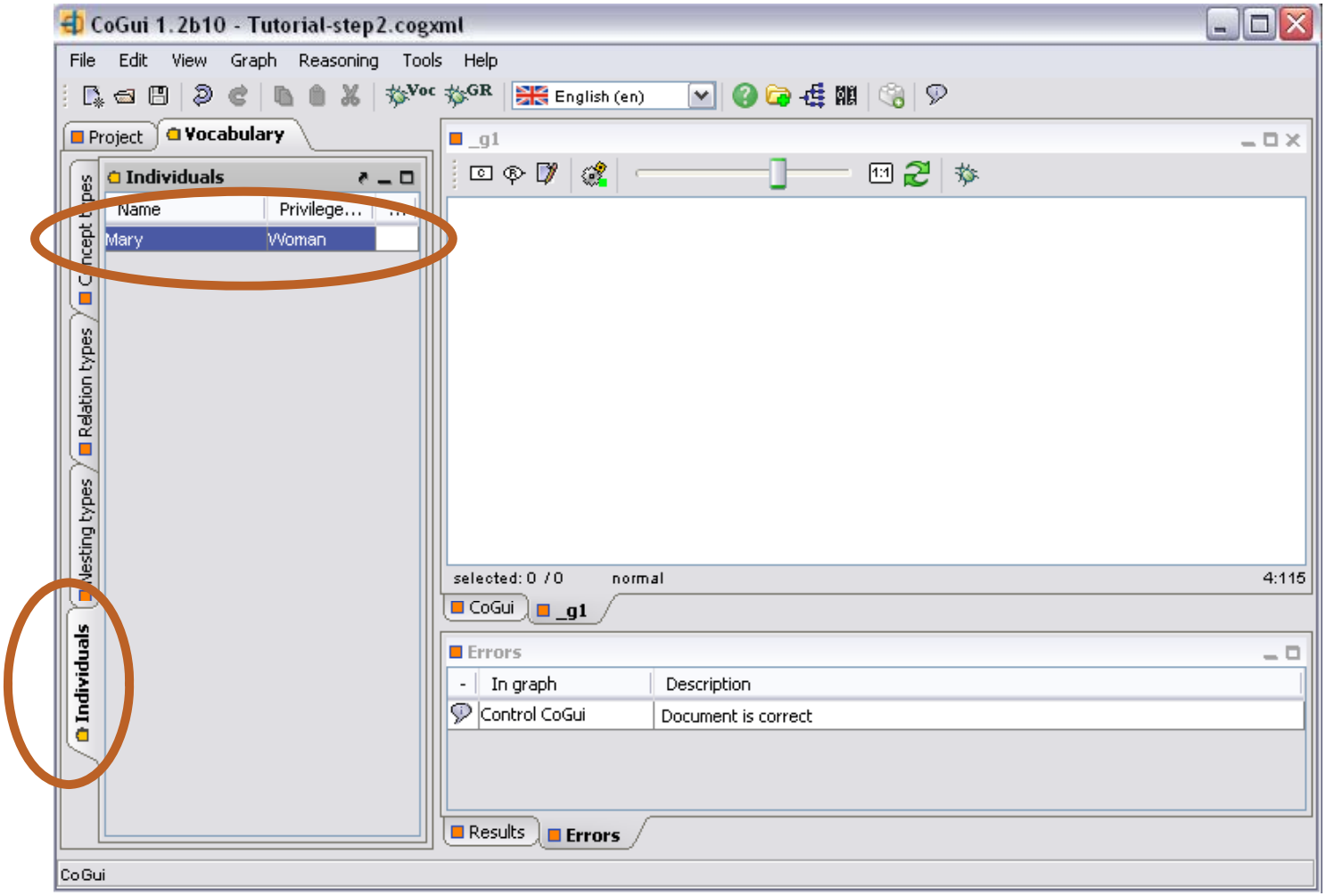
To add an individual marker to a concept just type the name of the individual



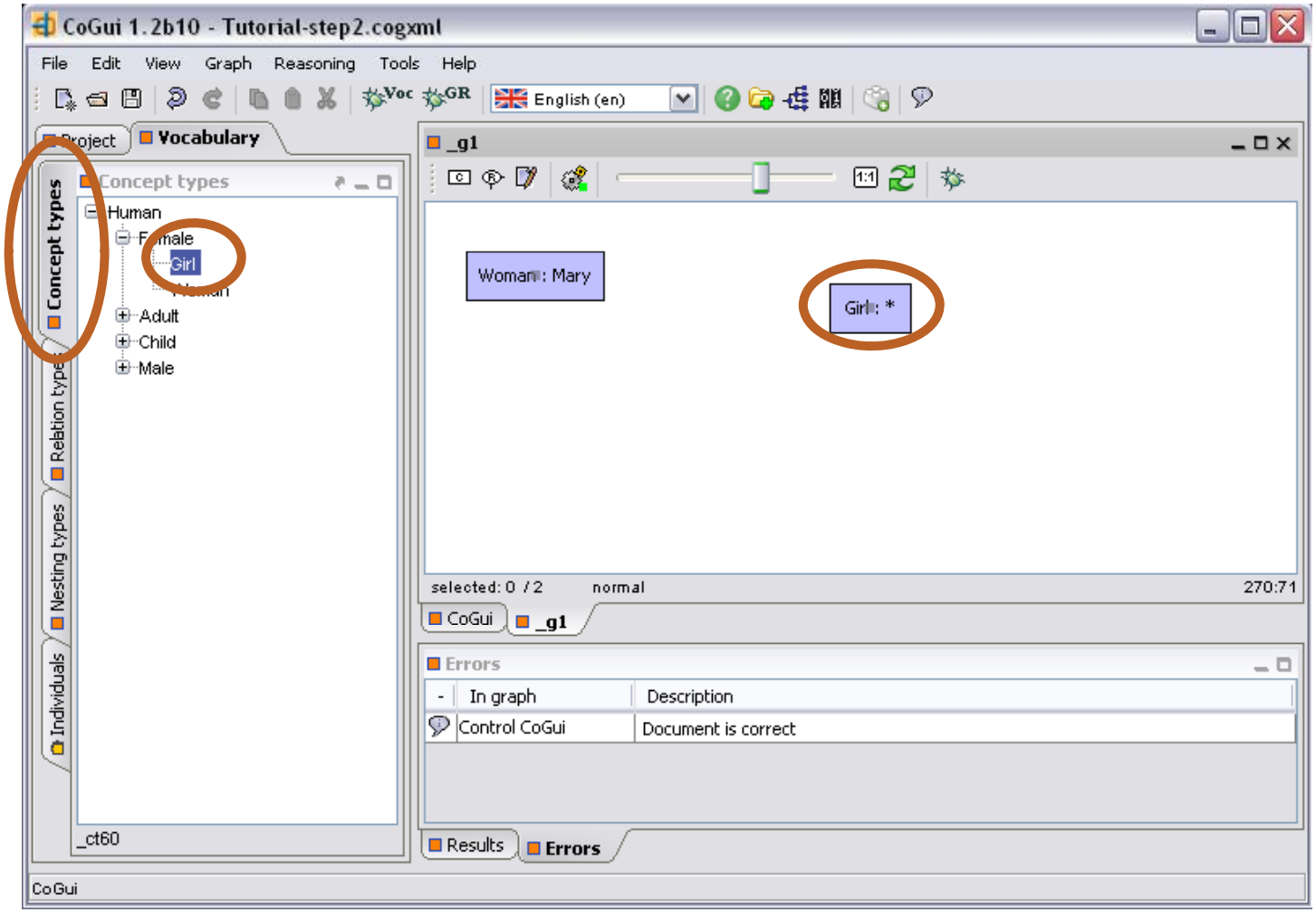
A CONCEPT NODE PART OF A FACT



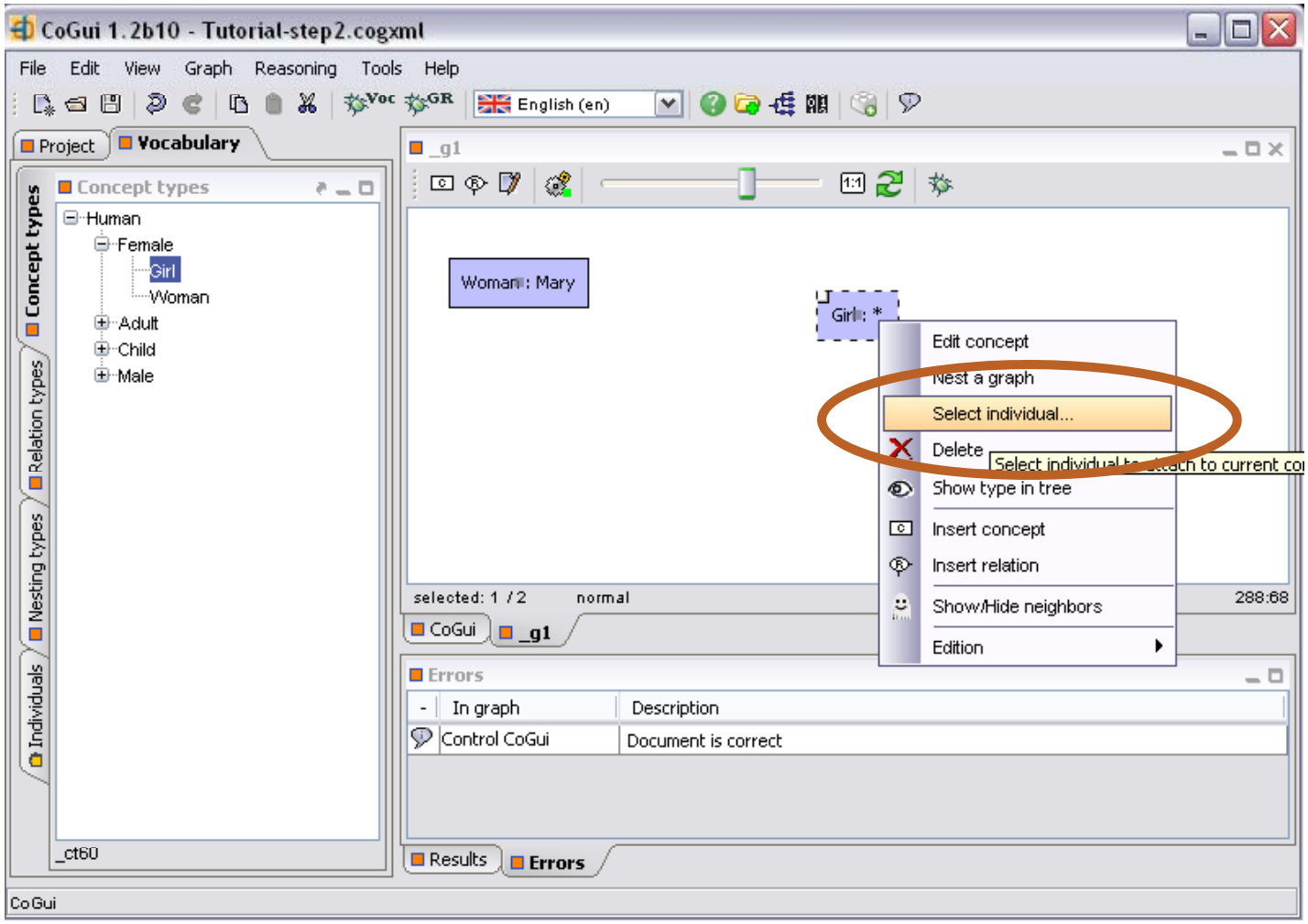
To add a concept node with an individual marker, alternatively, drag and drop from the individuals view to the fact editor



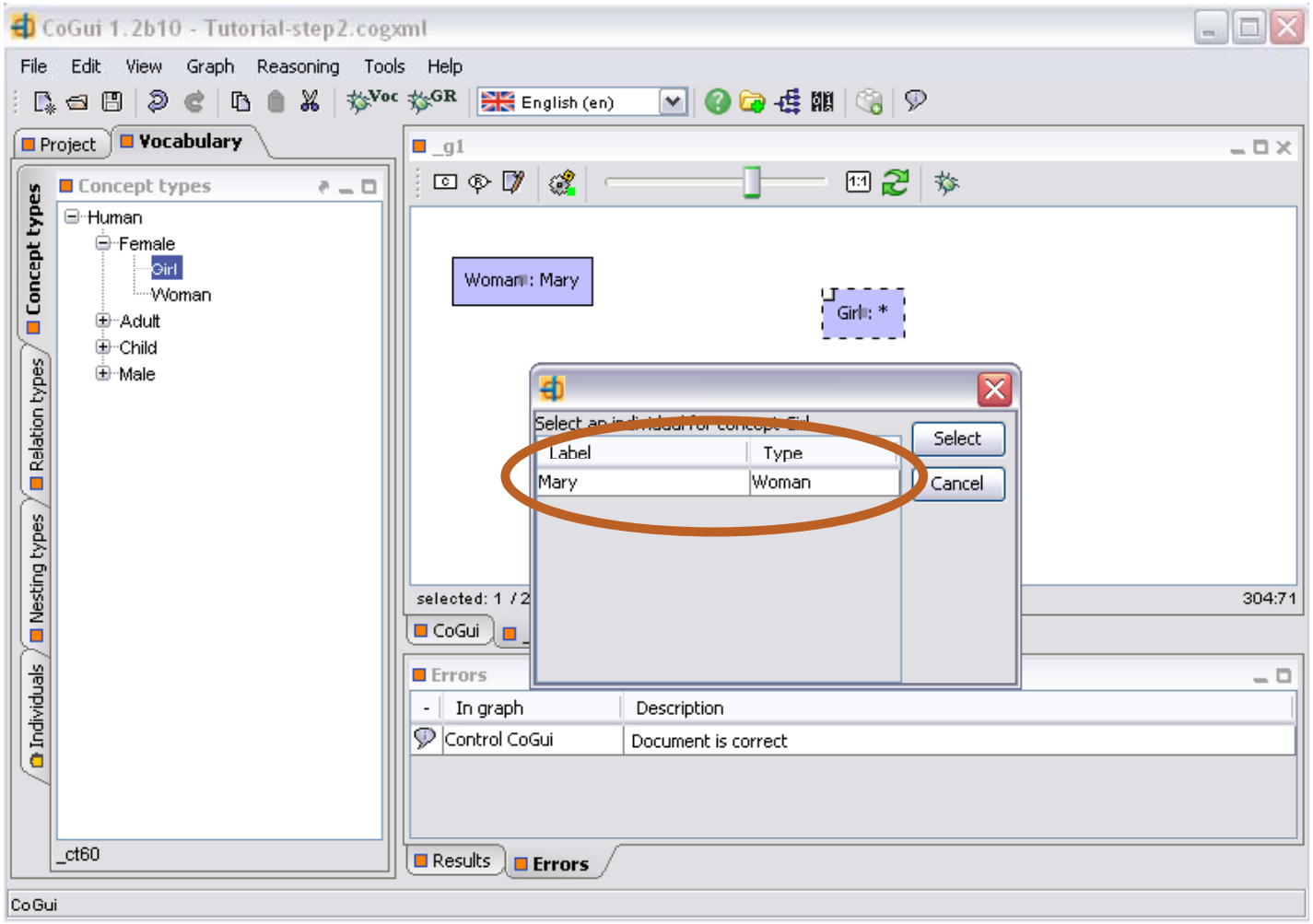
To enter a concept node of a given type drag and drop the concept from the tree view of the vocabulary



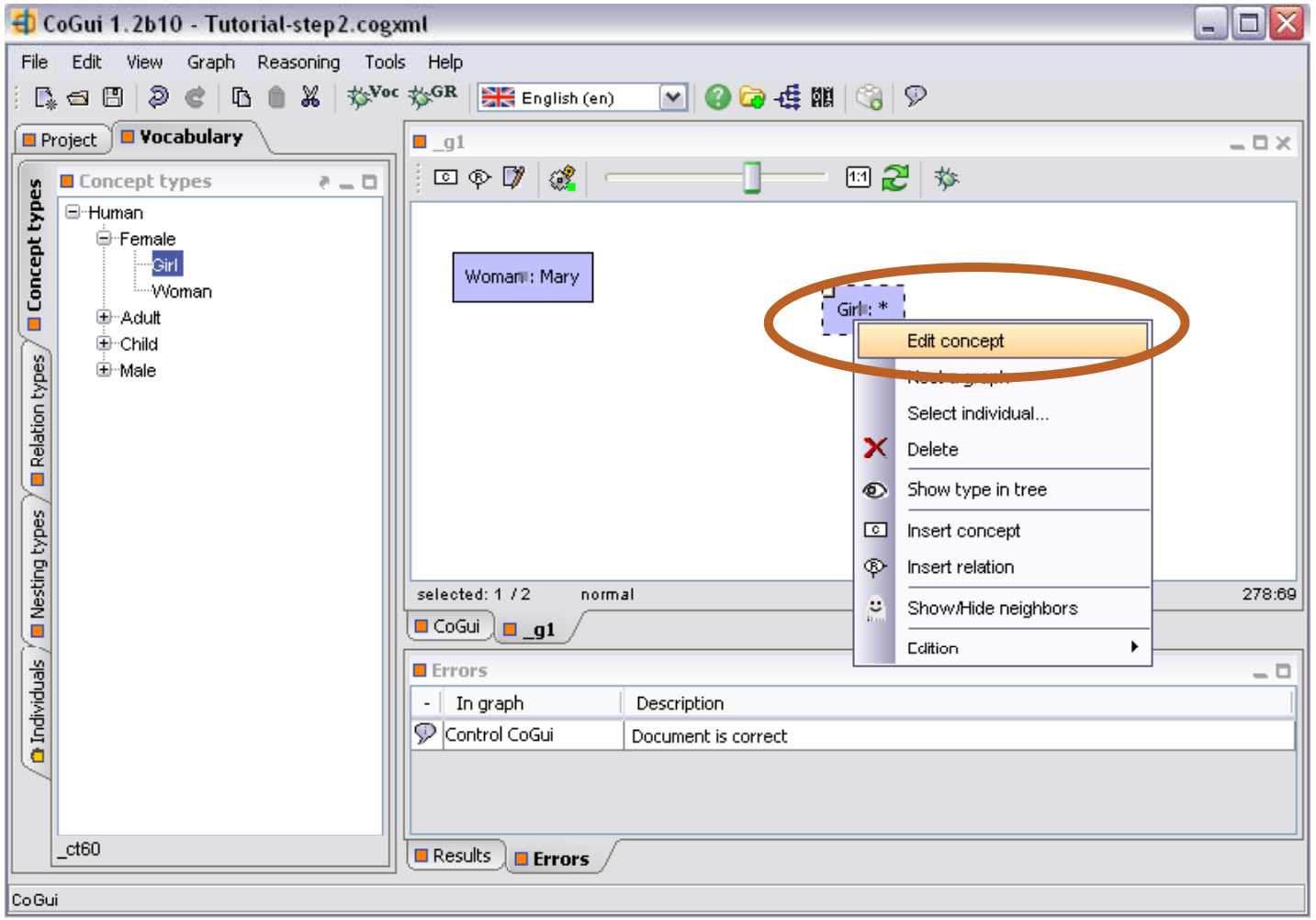
To add an individual marker to a concept node you can also select the individual from the individuals list



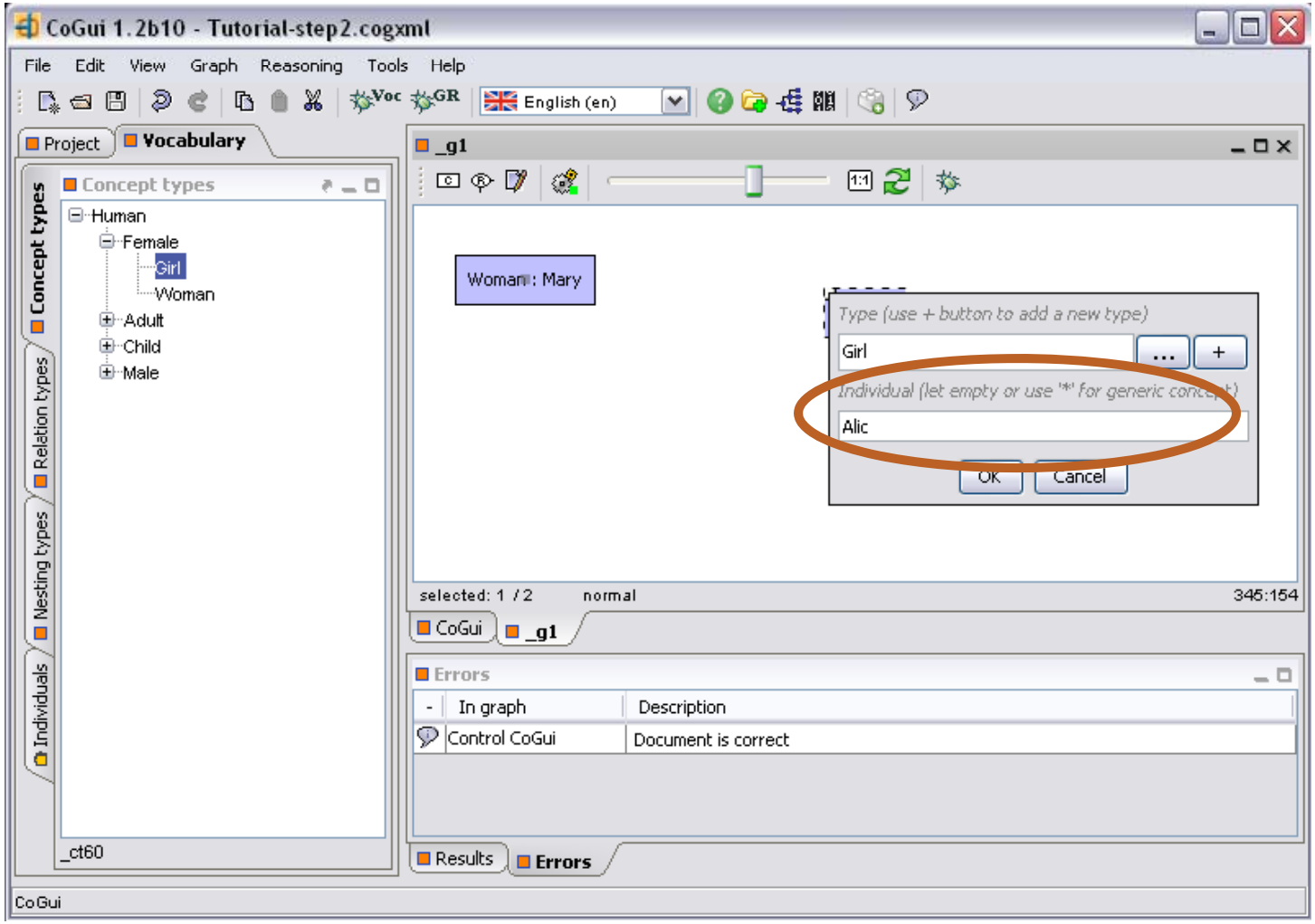
If the individual is not in the list do not panic!



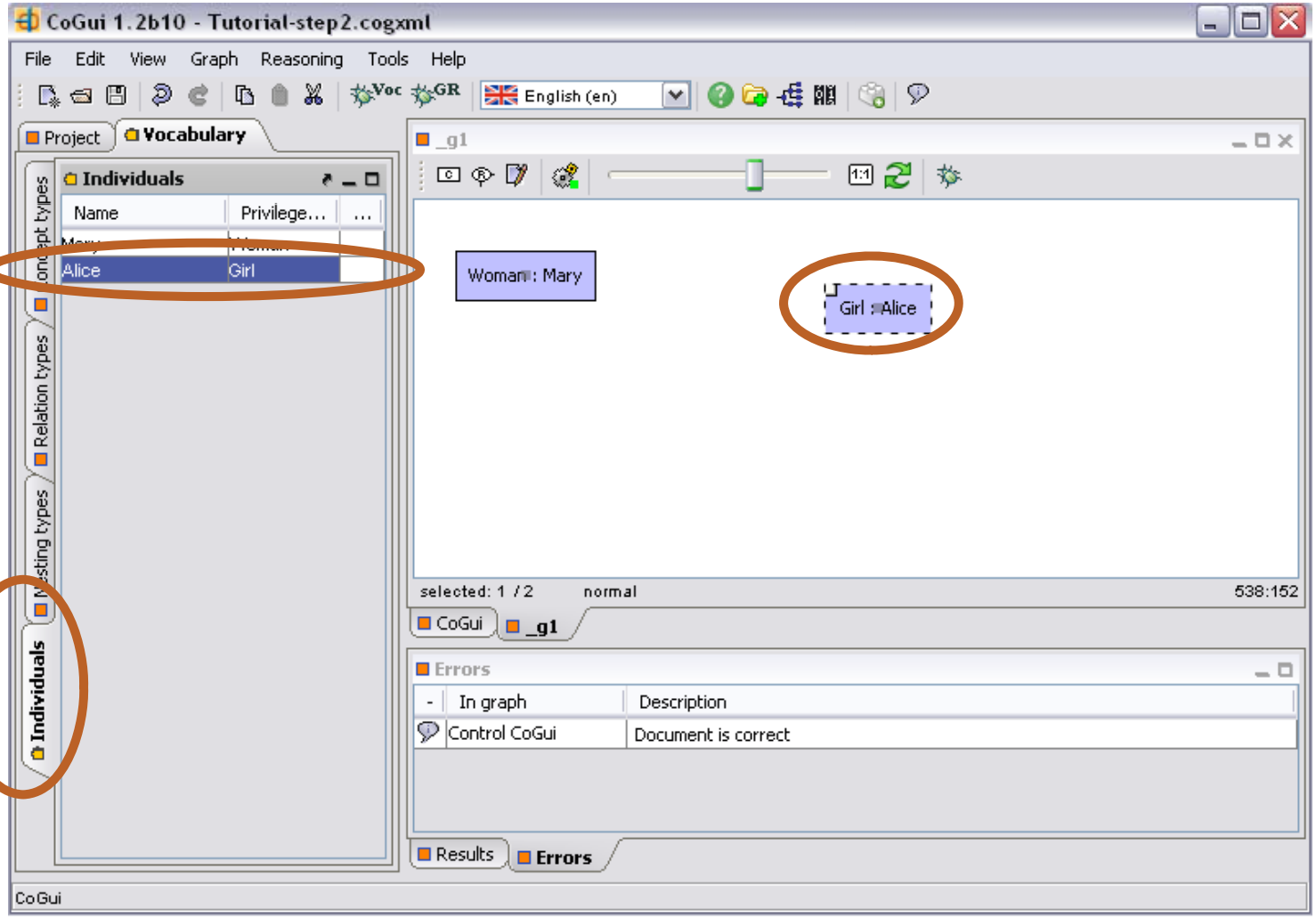
EDIT CONCEPT TO ENTER THE INDIVIDUAL BY HAND



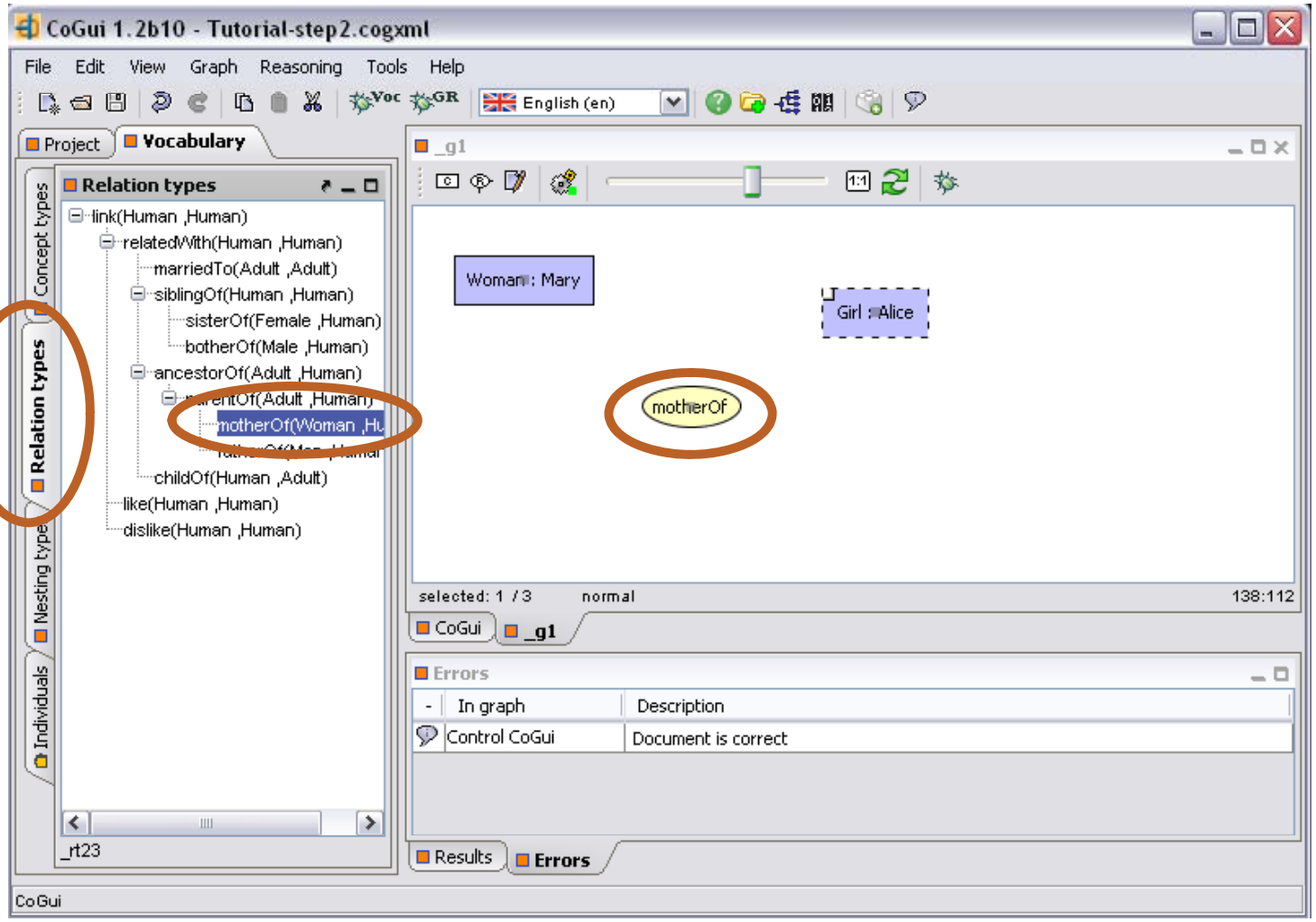
SIMPLY WRITE THE NAME OF THE INDIVIDUAL



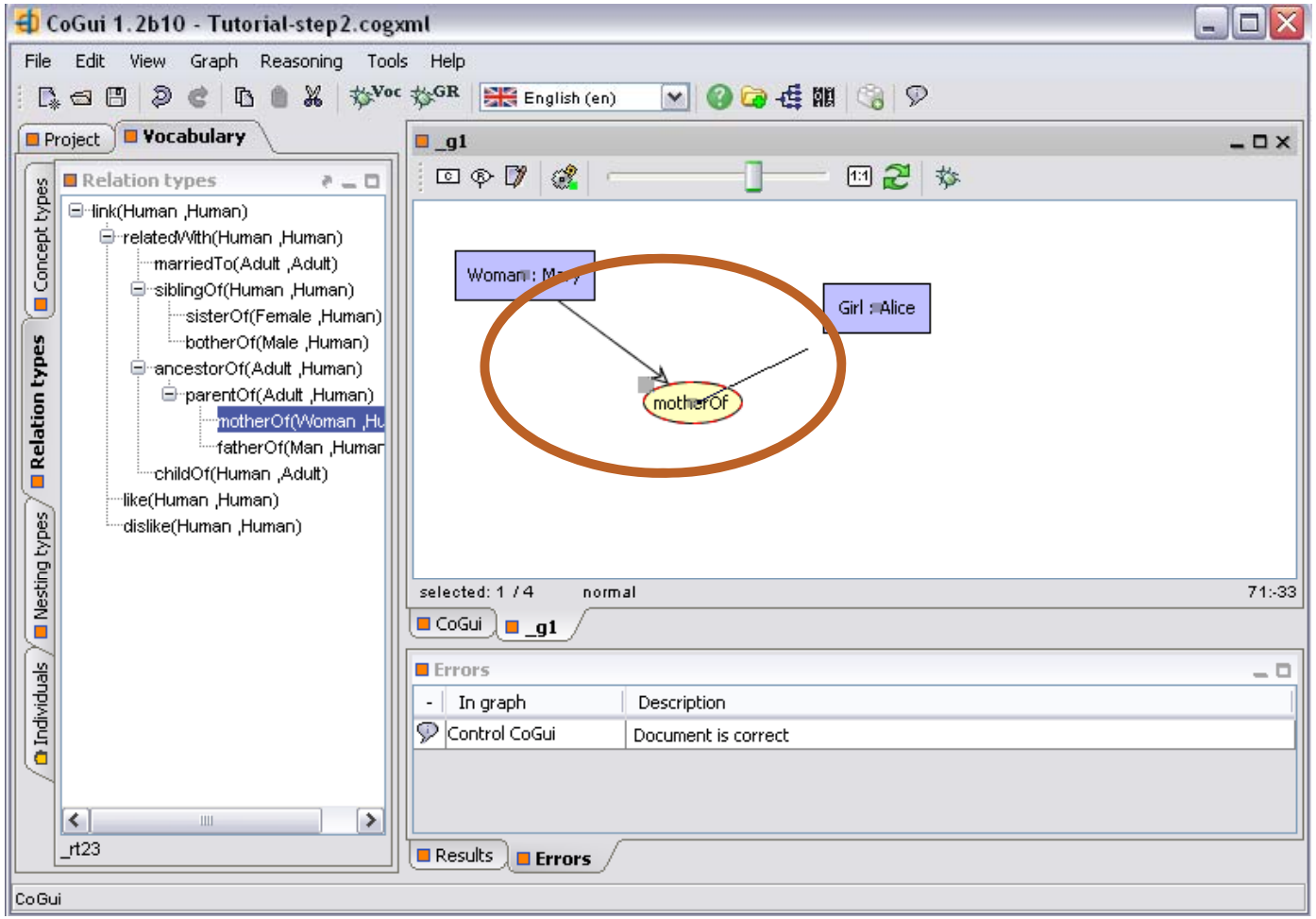
Once you write the name of the individual in the concept node, the individual will appear in the individual list too



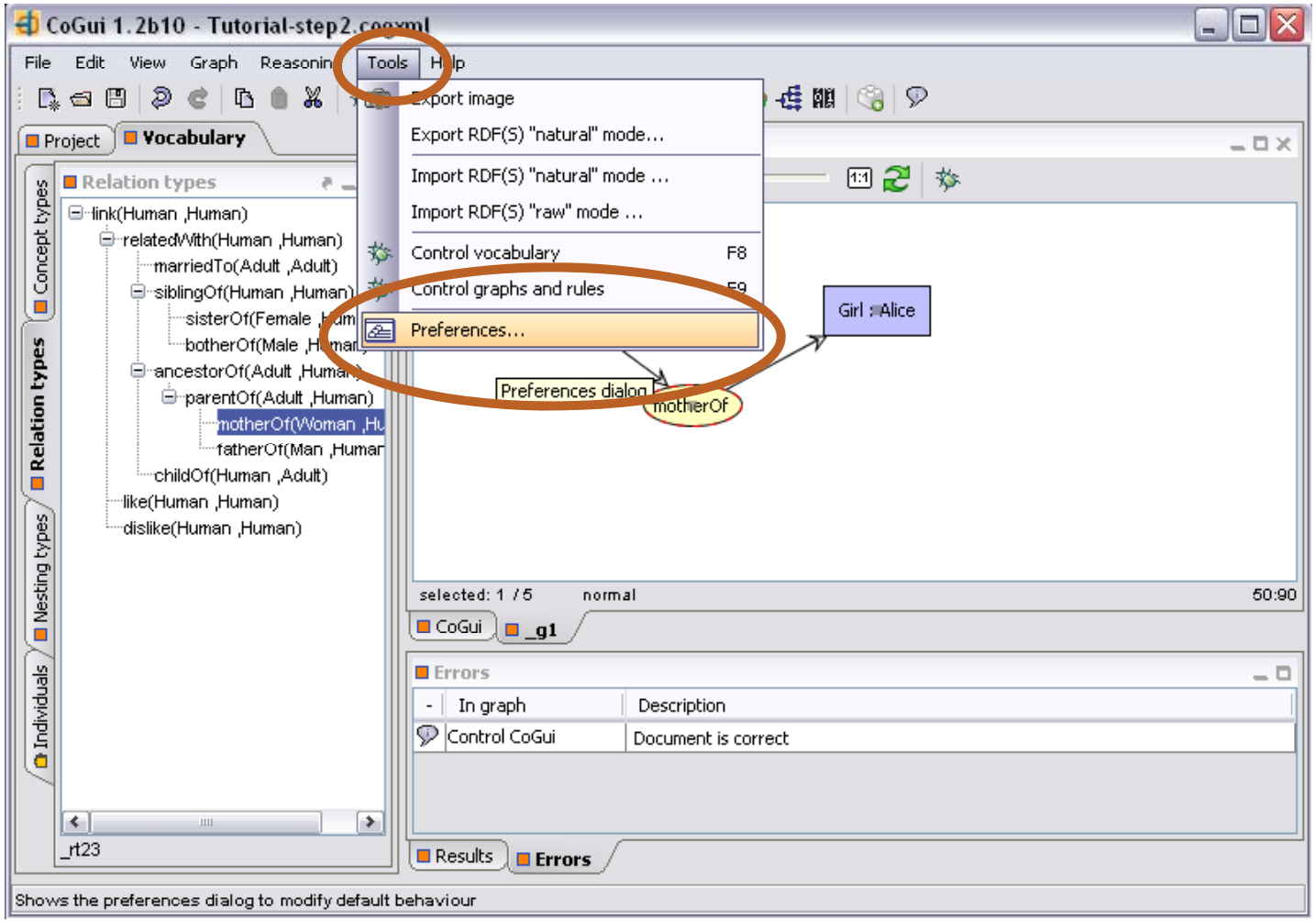
To add a relation drag and drop the relation from the tree view of the vocabulary



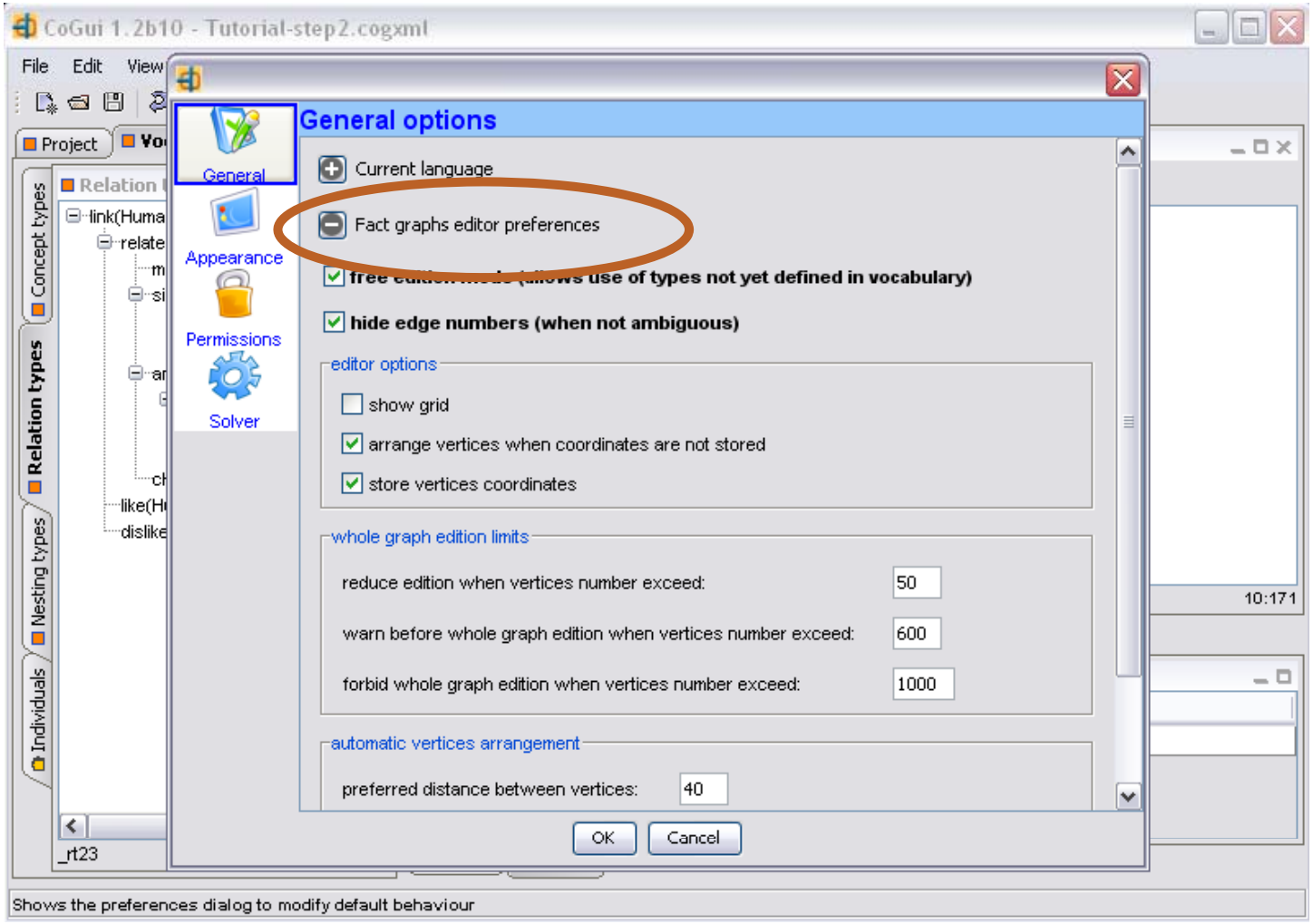
To link the relation to desired concepts click the middle of the relation node then drag and drop the edge towards concepts



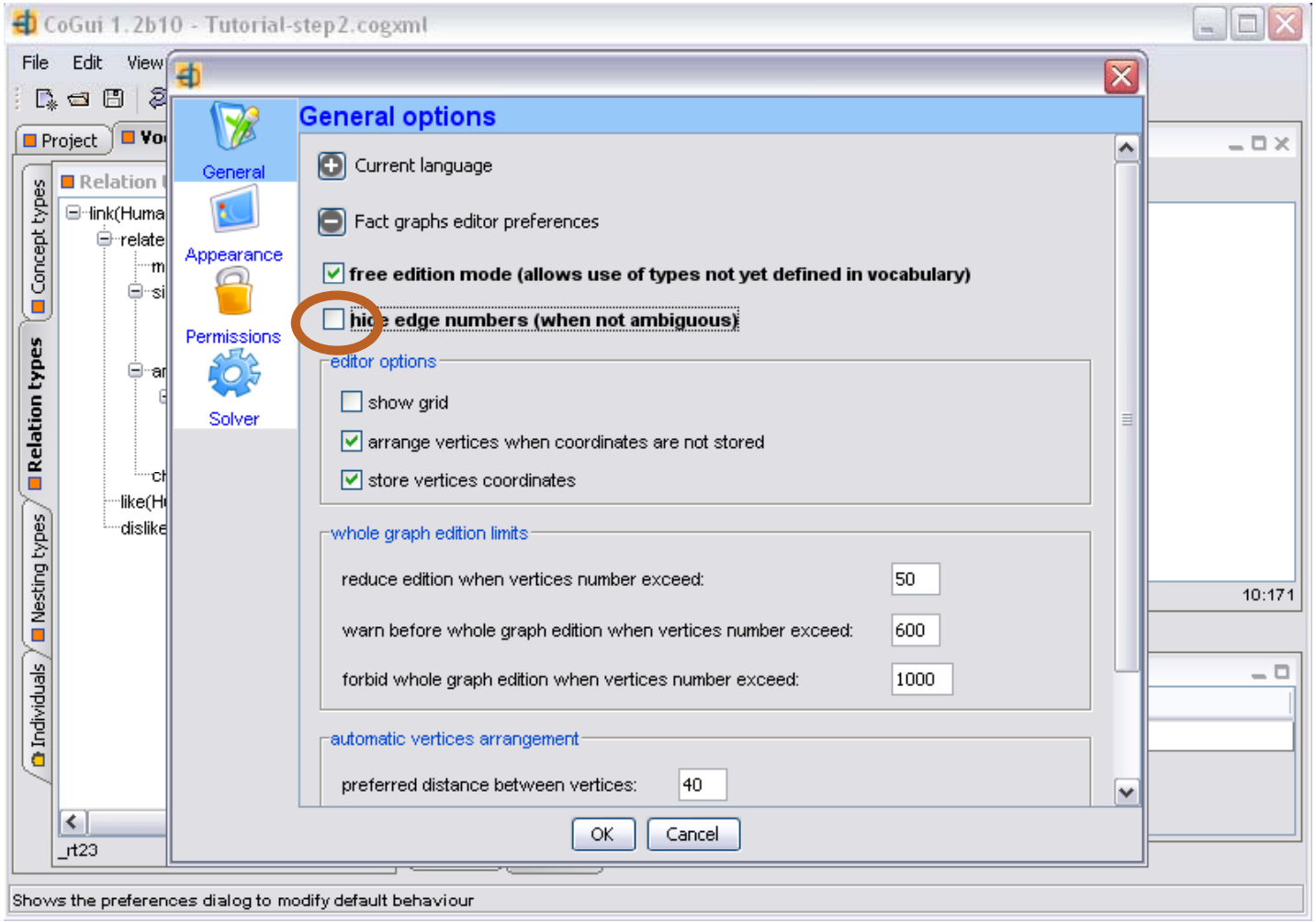
To change the appearance of edges in the fact graph go to preferences



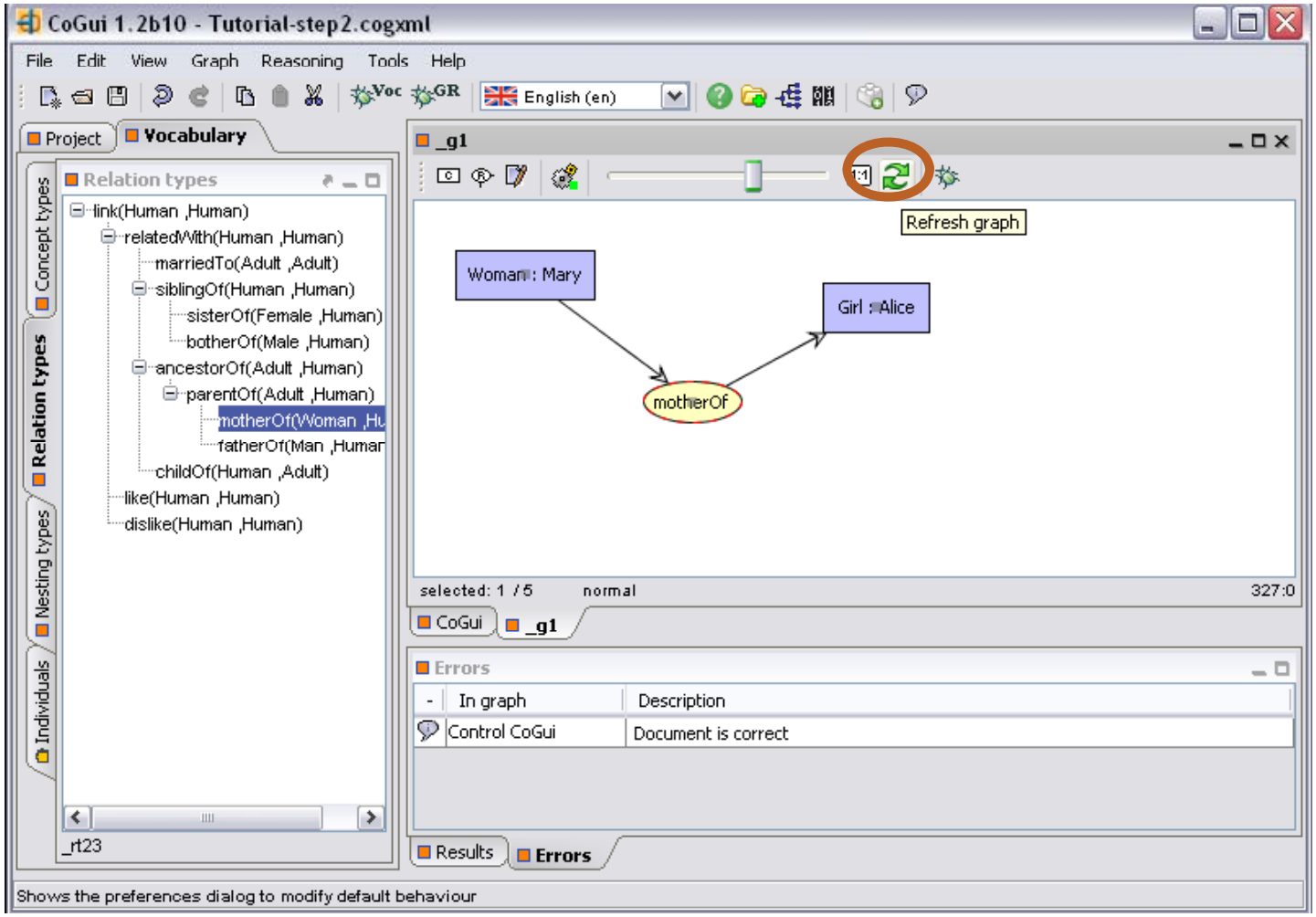
In general options select fact graphs editor preferences



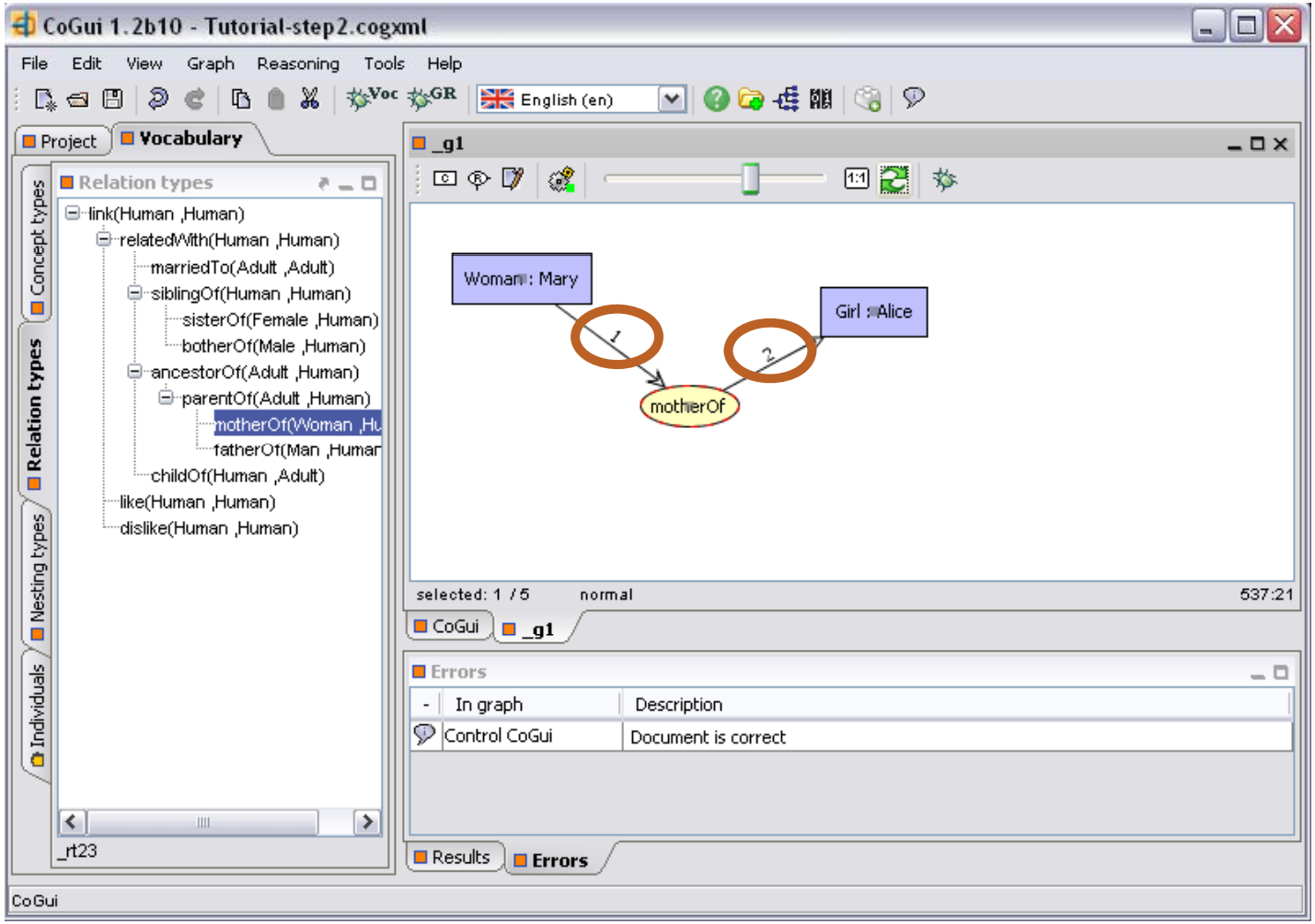
UNSELECT HIDE EDGE NUMBERS



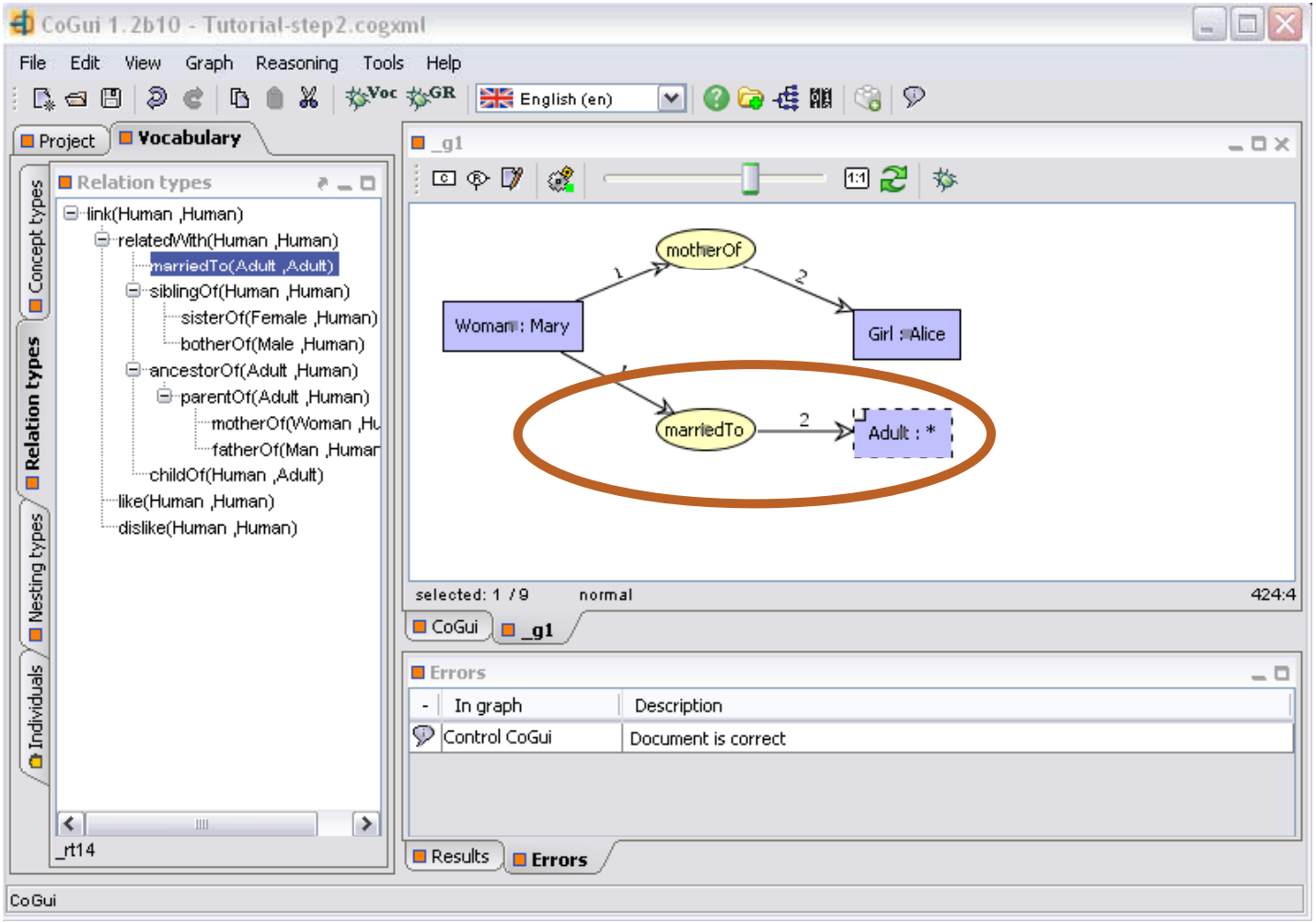
To apply the changes to your graph you have to refresh the graph view



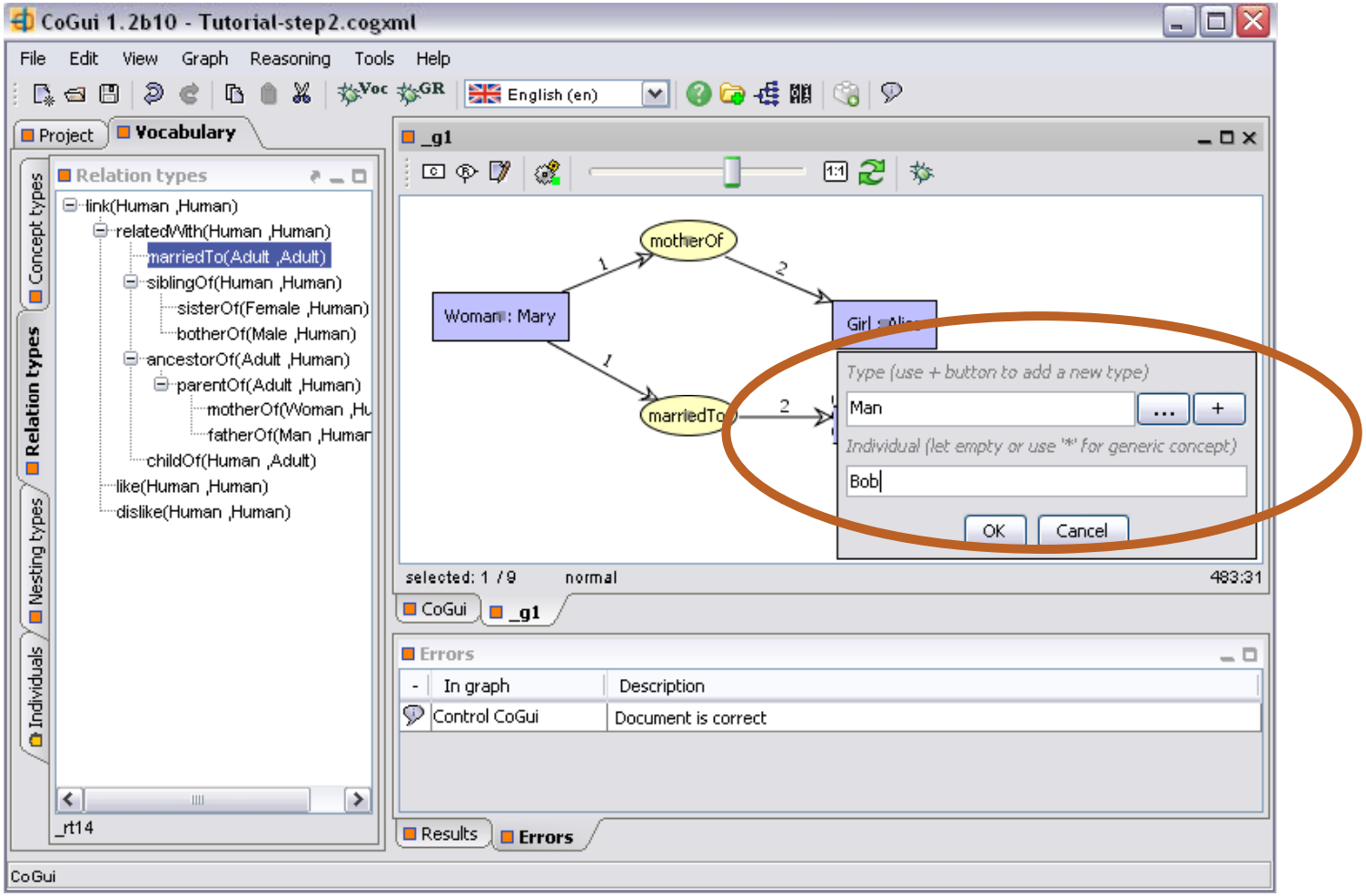
THE EDGES ARE NOW NUMBERED



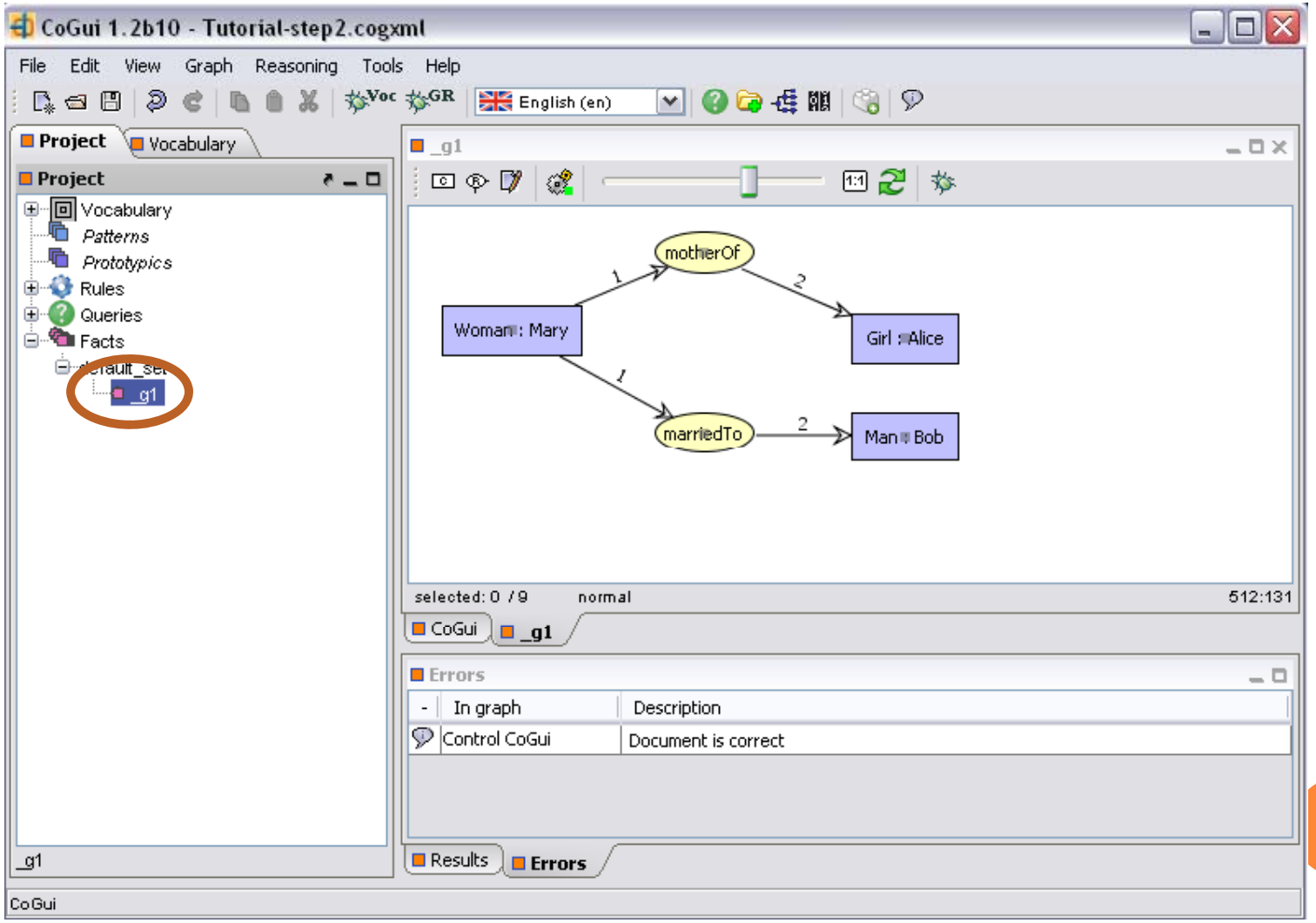
ADD A NEW RELATION TO THE GRAPH AND DRAG AND DROP FROM THE MIDDLE OF THE RELATION TO THE EMPTY SCREEN TO CREATE CONCEPTS



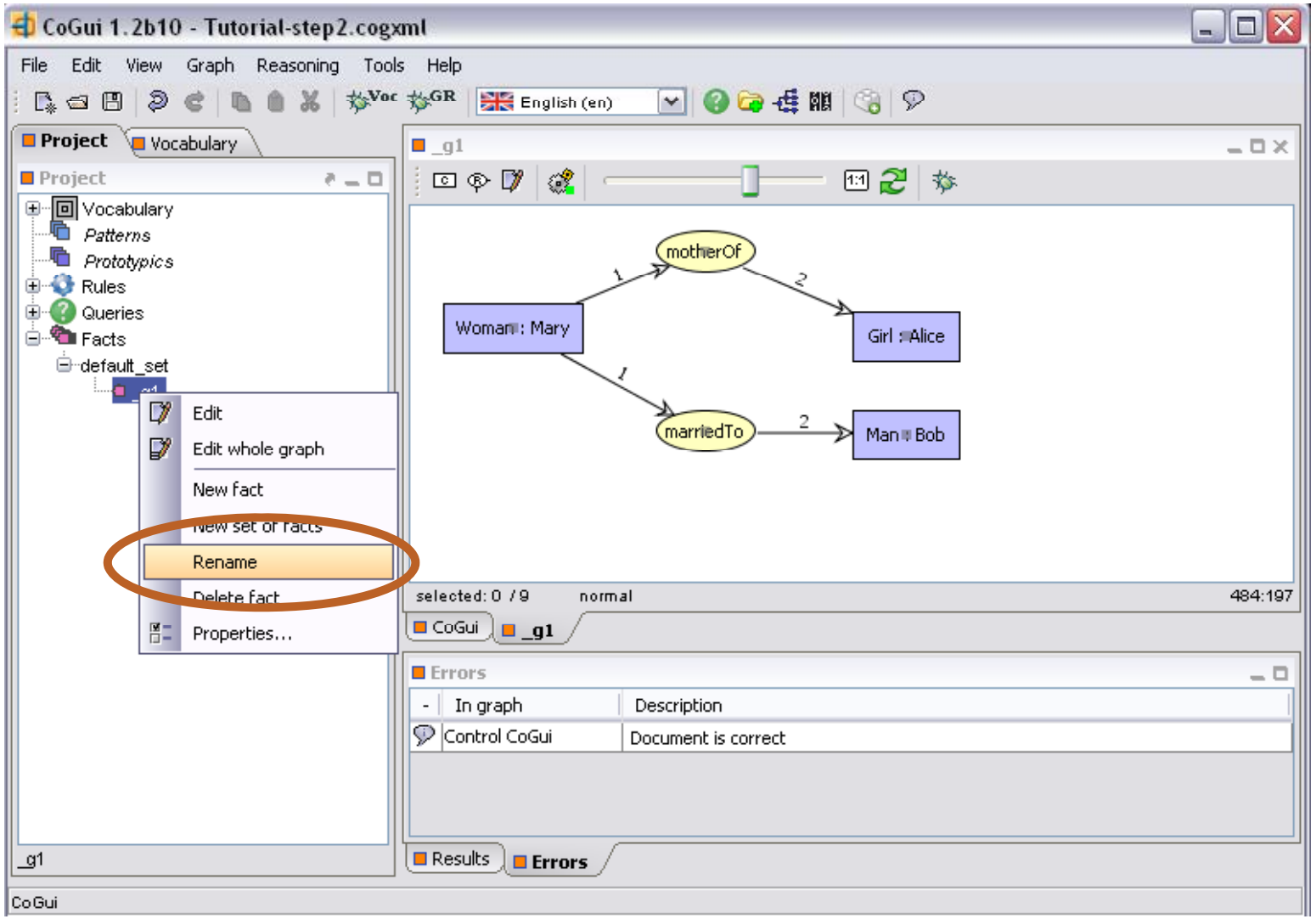
THE ADDED CONCEPT WILL HAVE THE TYPE CORRESPONDING TO THE RELATION SIGNATURE – REFINE IT BY RIGHT CLICK AND EDIT CONCEPT



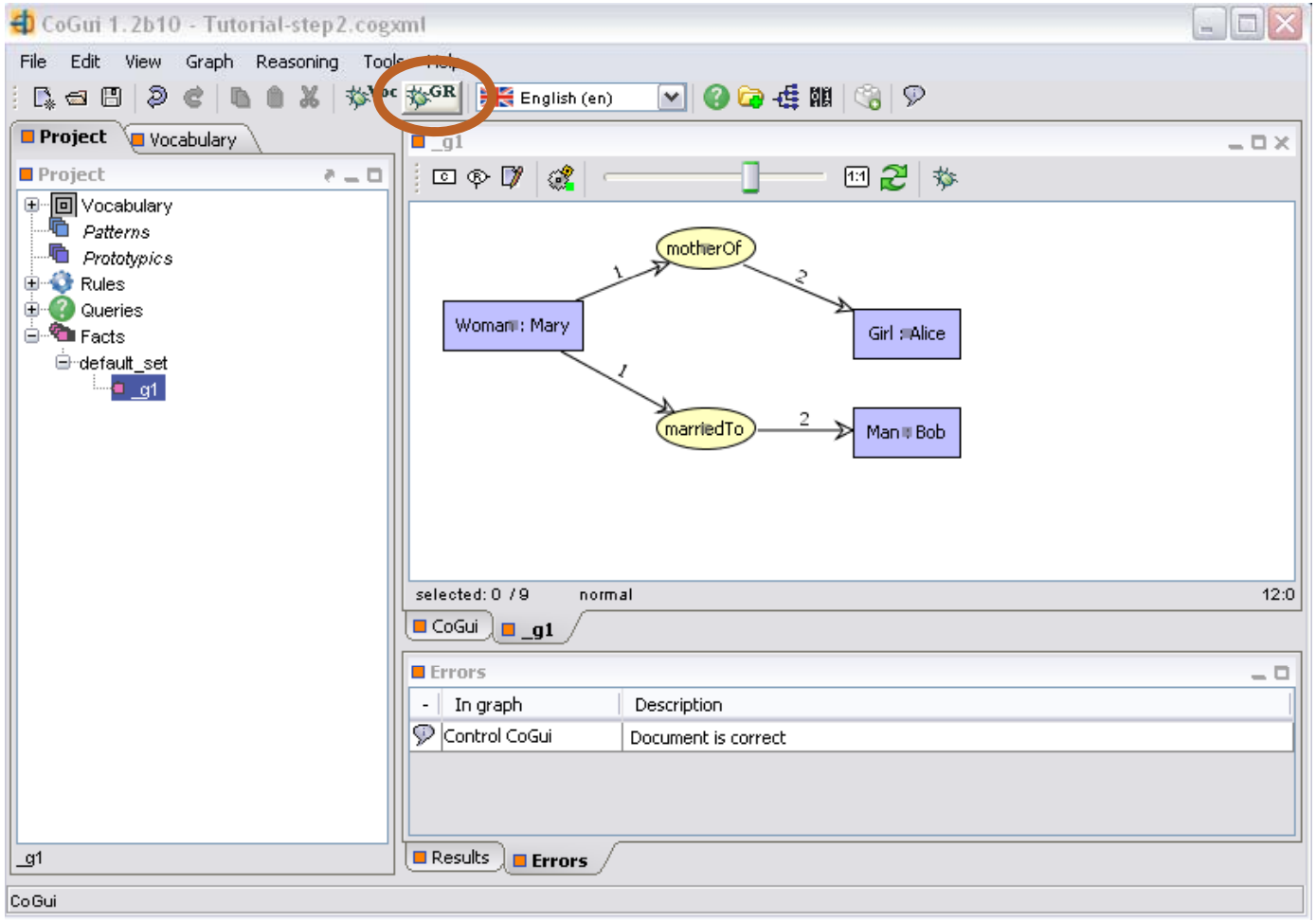
When you are happy with your fact right click on the name by default of the fact



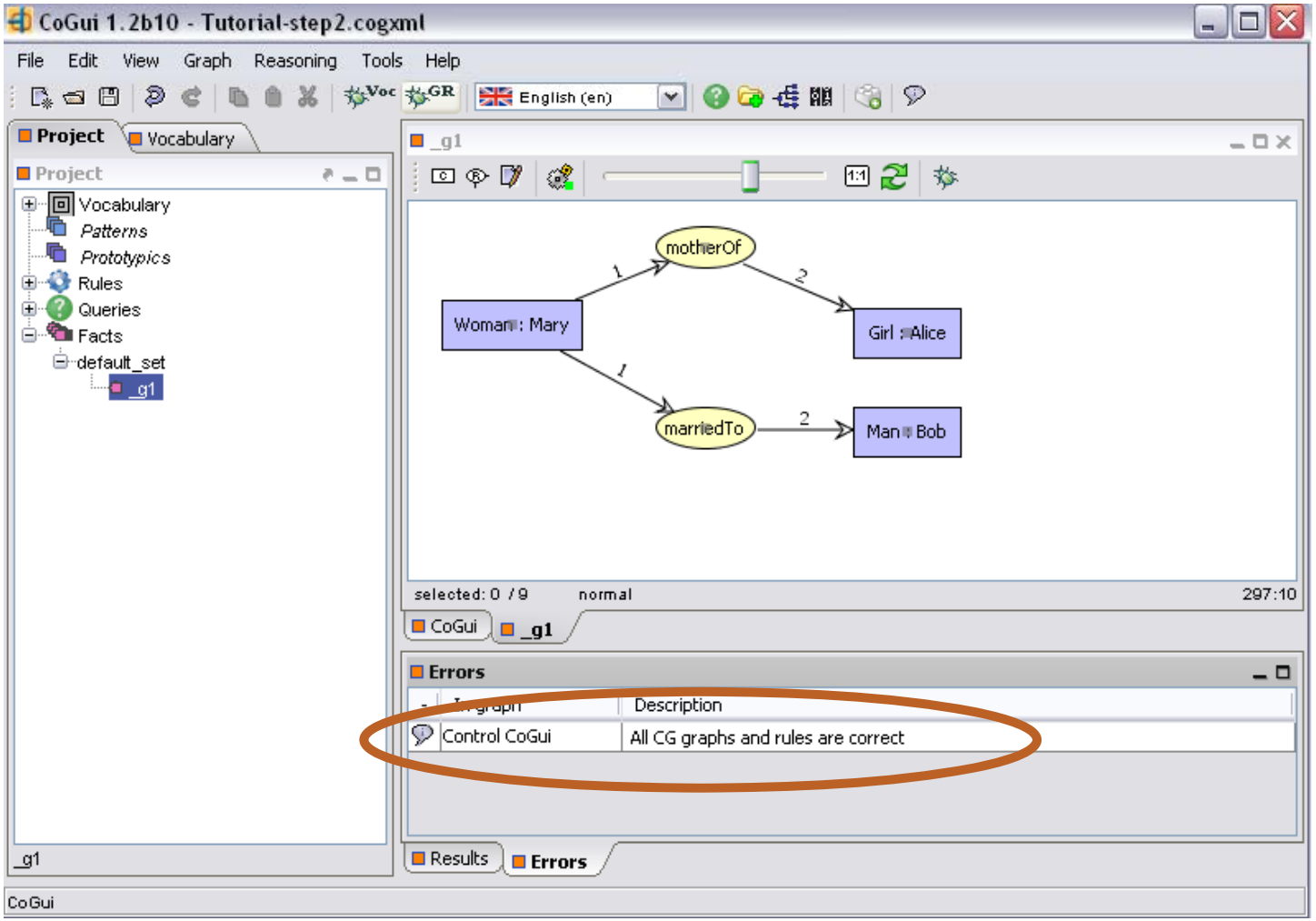
RENAME YOUR FACT GRAPH ACCORDINGLY



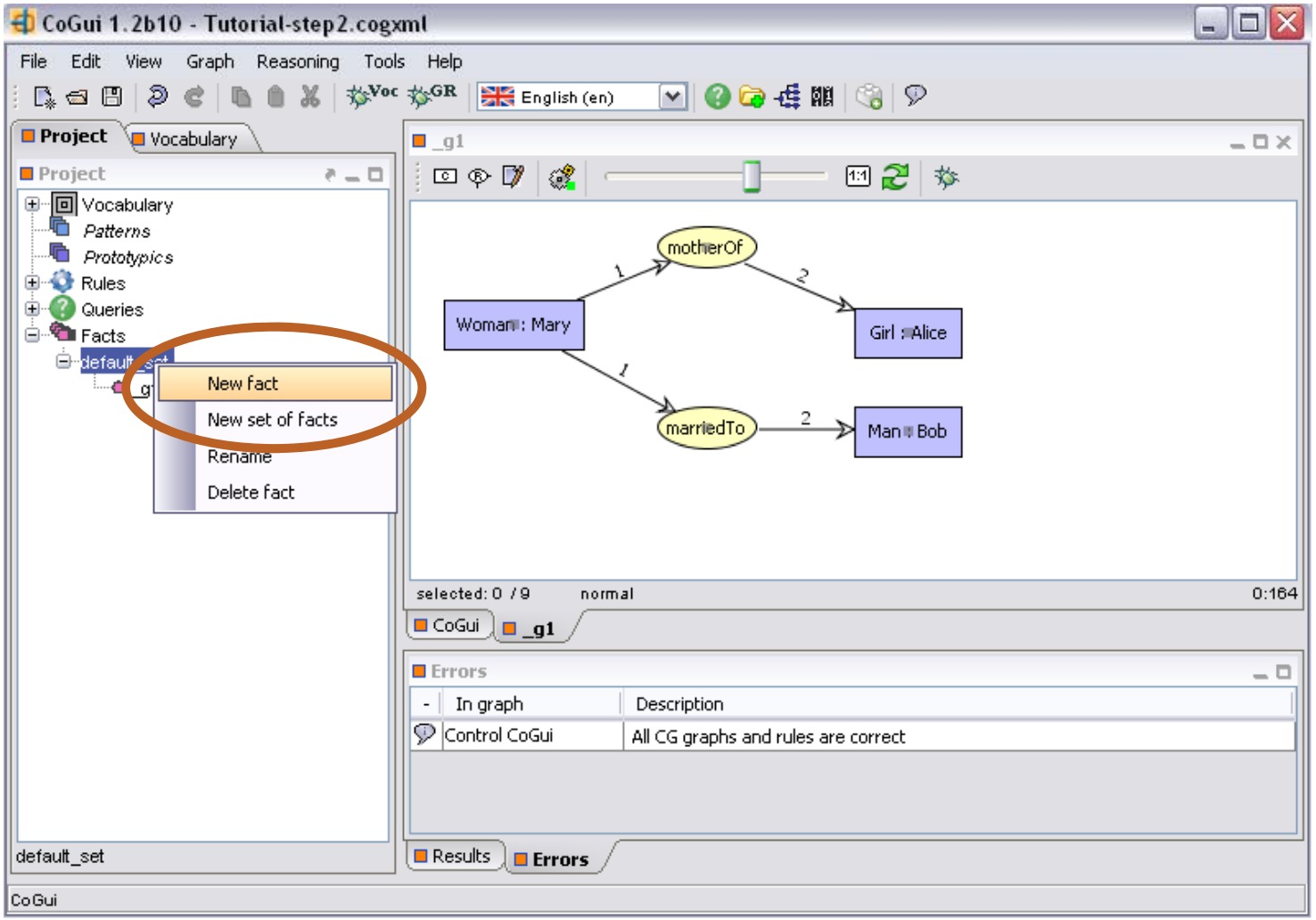
Do not forget to validate your fact graphs



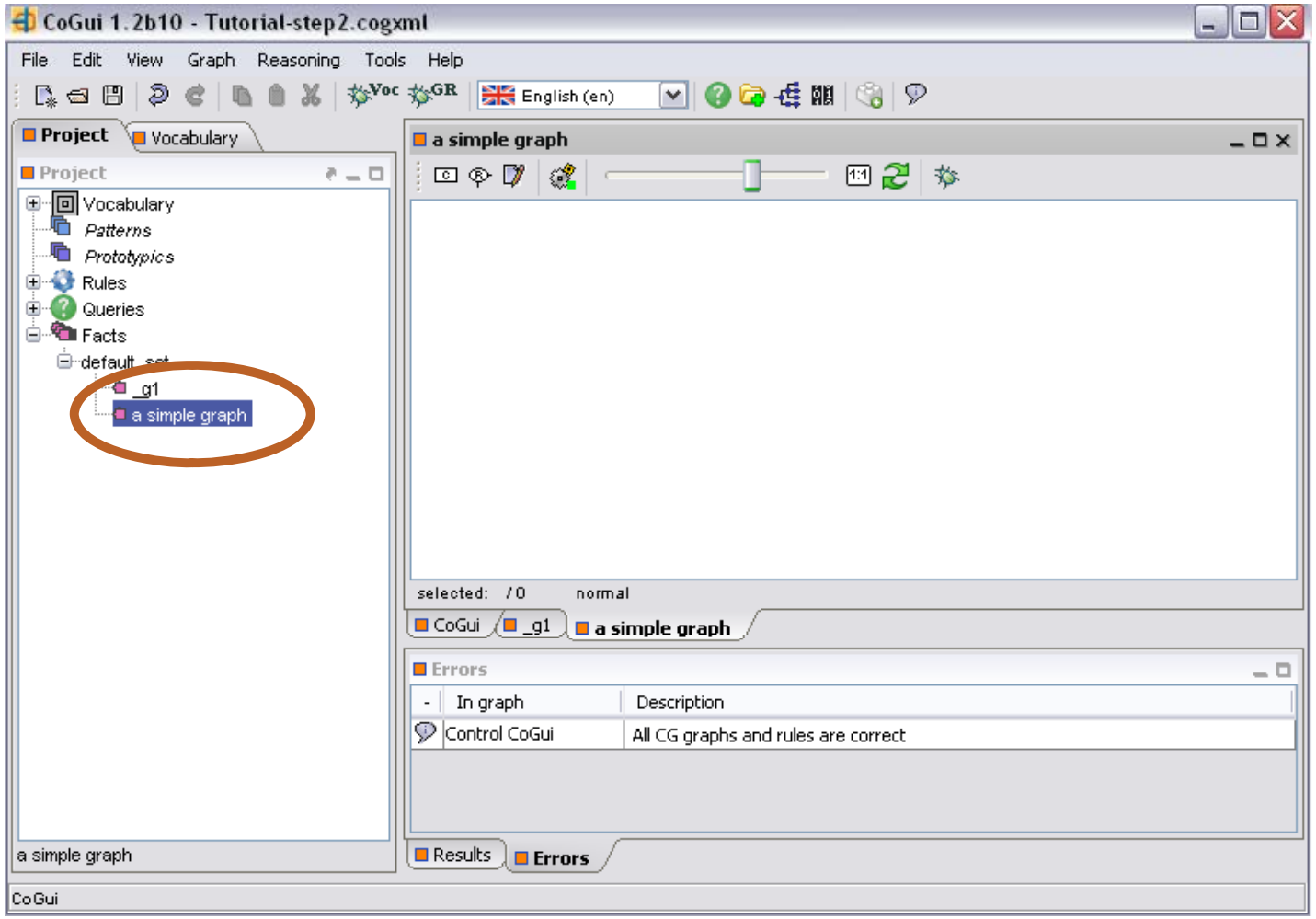
Follow the instructions after you validated your graph



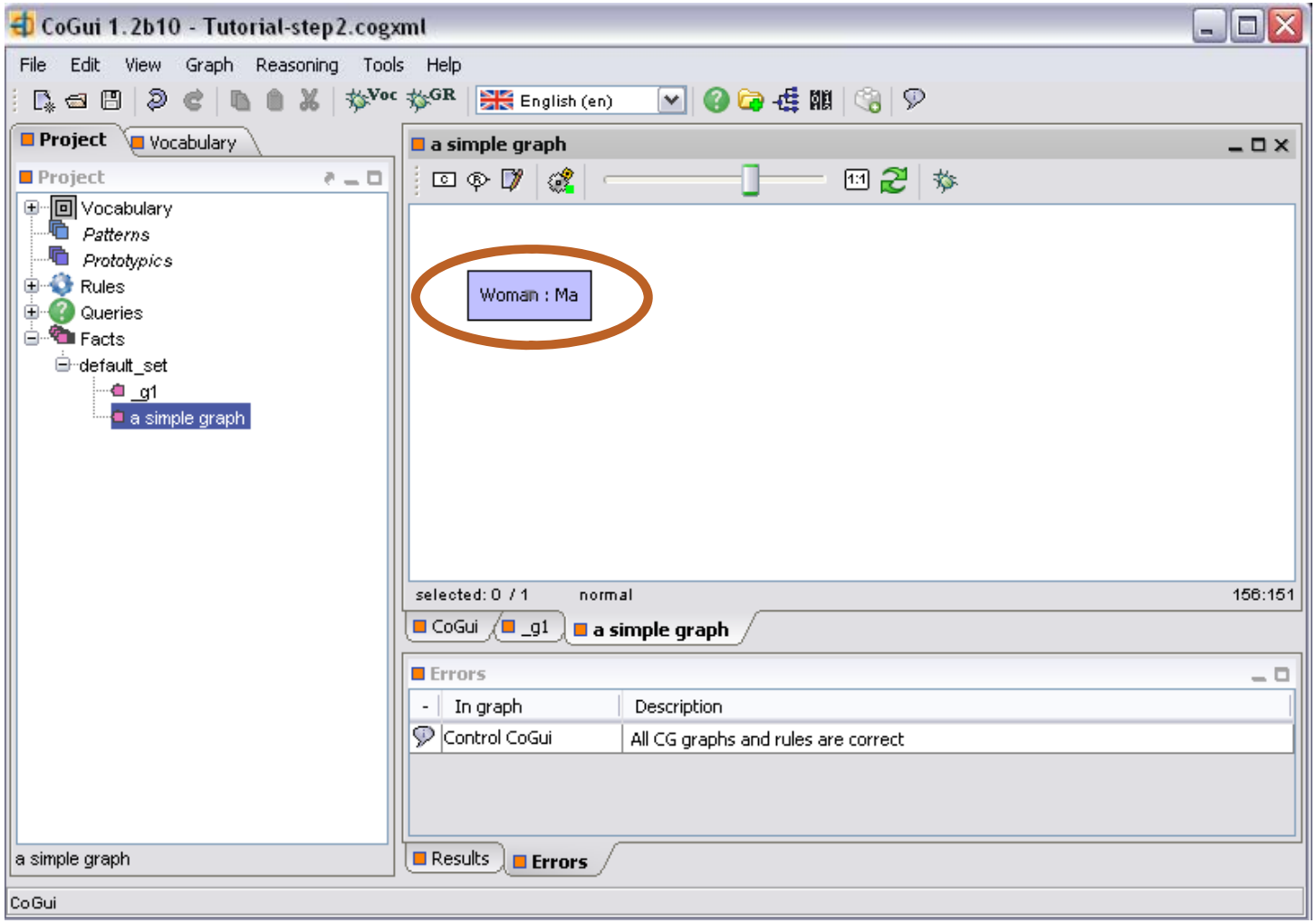
To create a new fact right click on default set and select new fact



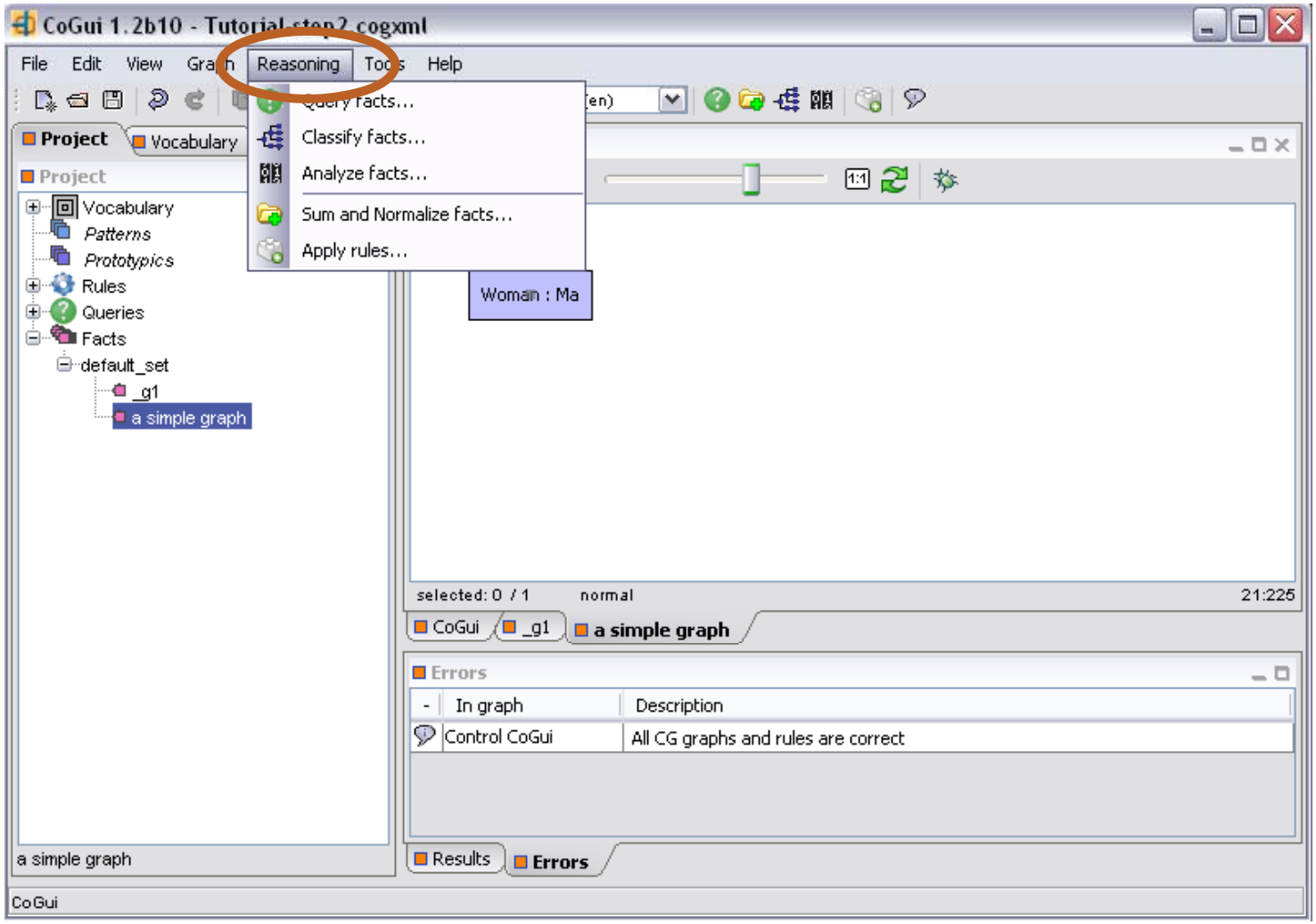
You can name your graph after you created it



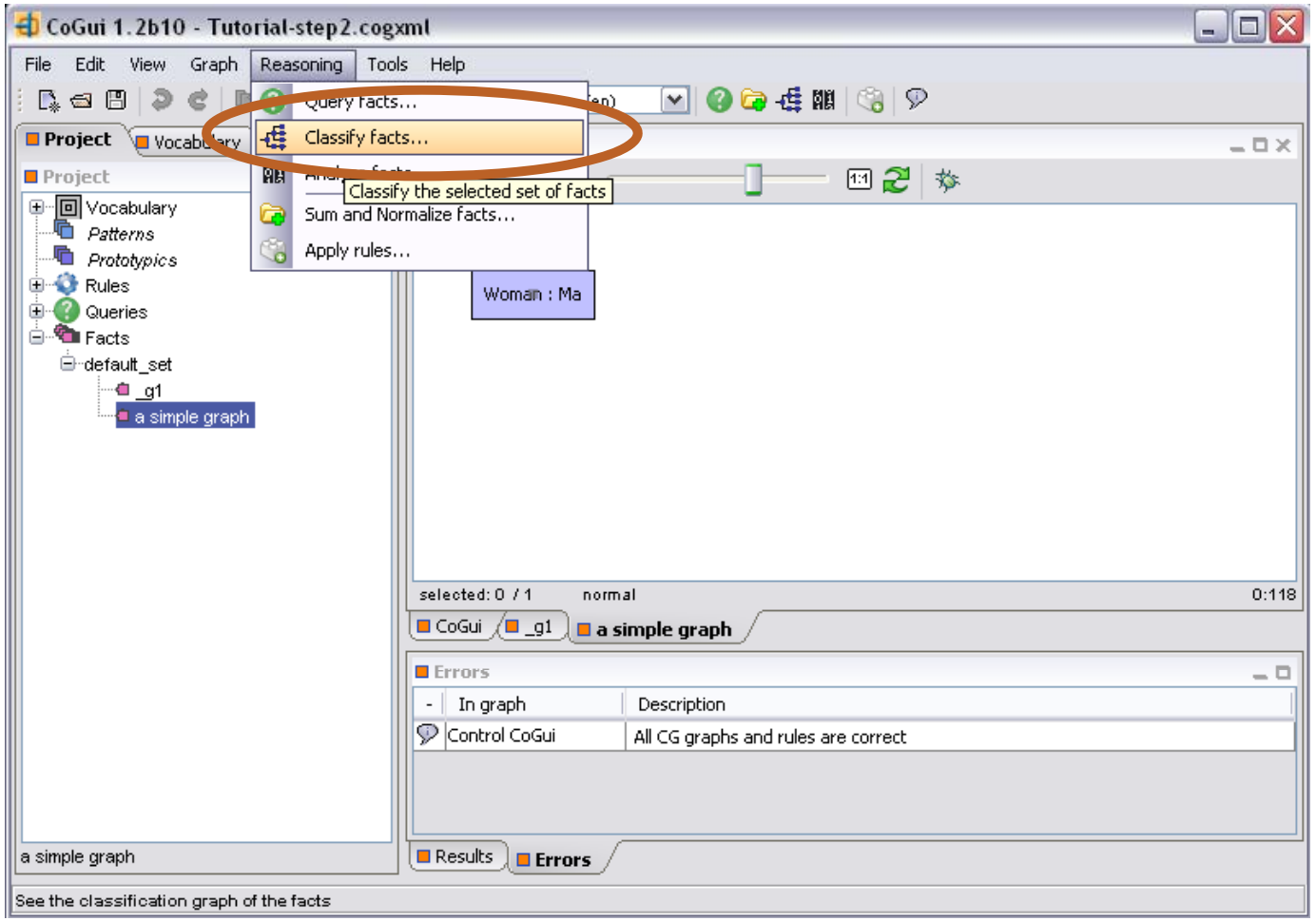
A FACT GRAPH CAN CONSIST OF A SINGLE CONCEPT NODE (BUT NOT A SINGLE RELATION NODE)



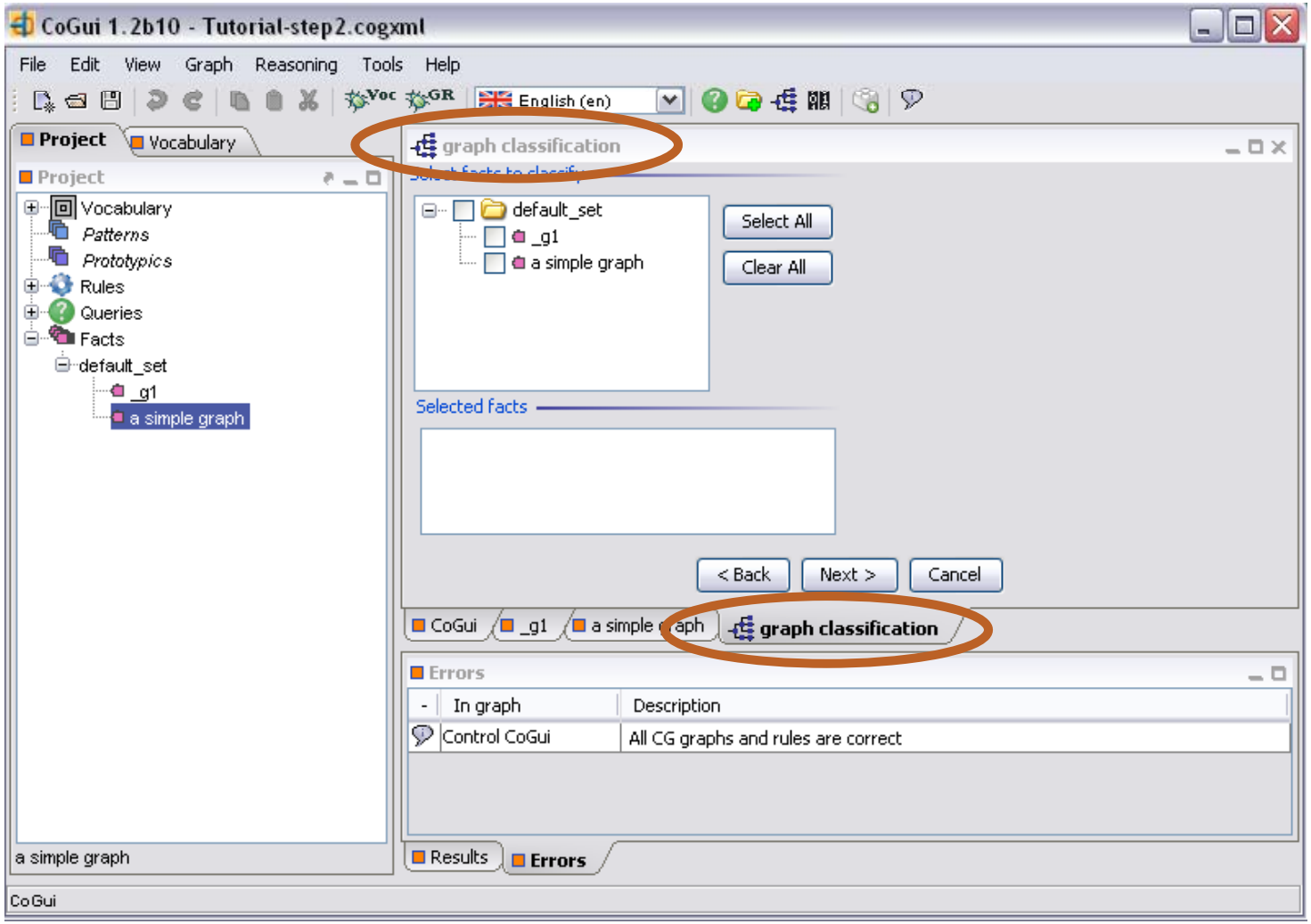
Click on reasoning for operations on the facts



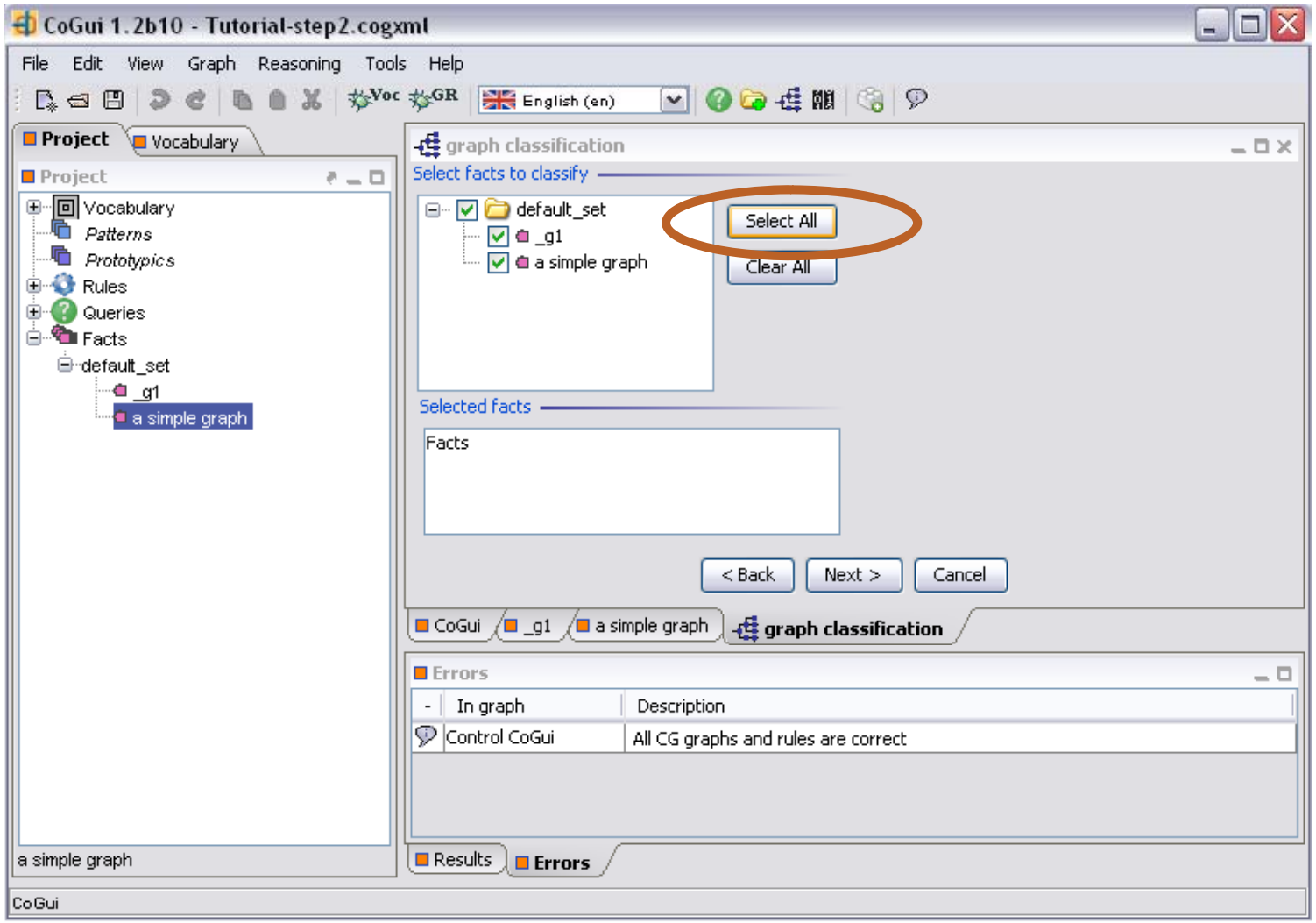
To classify facts select classify facts



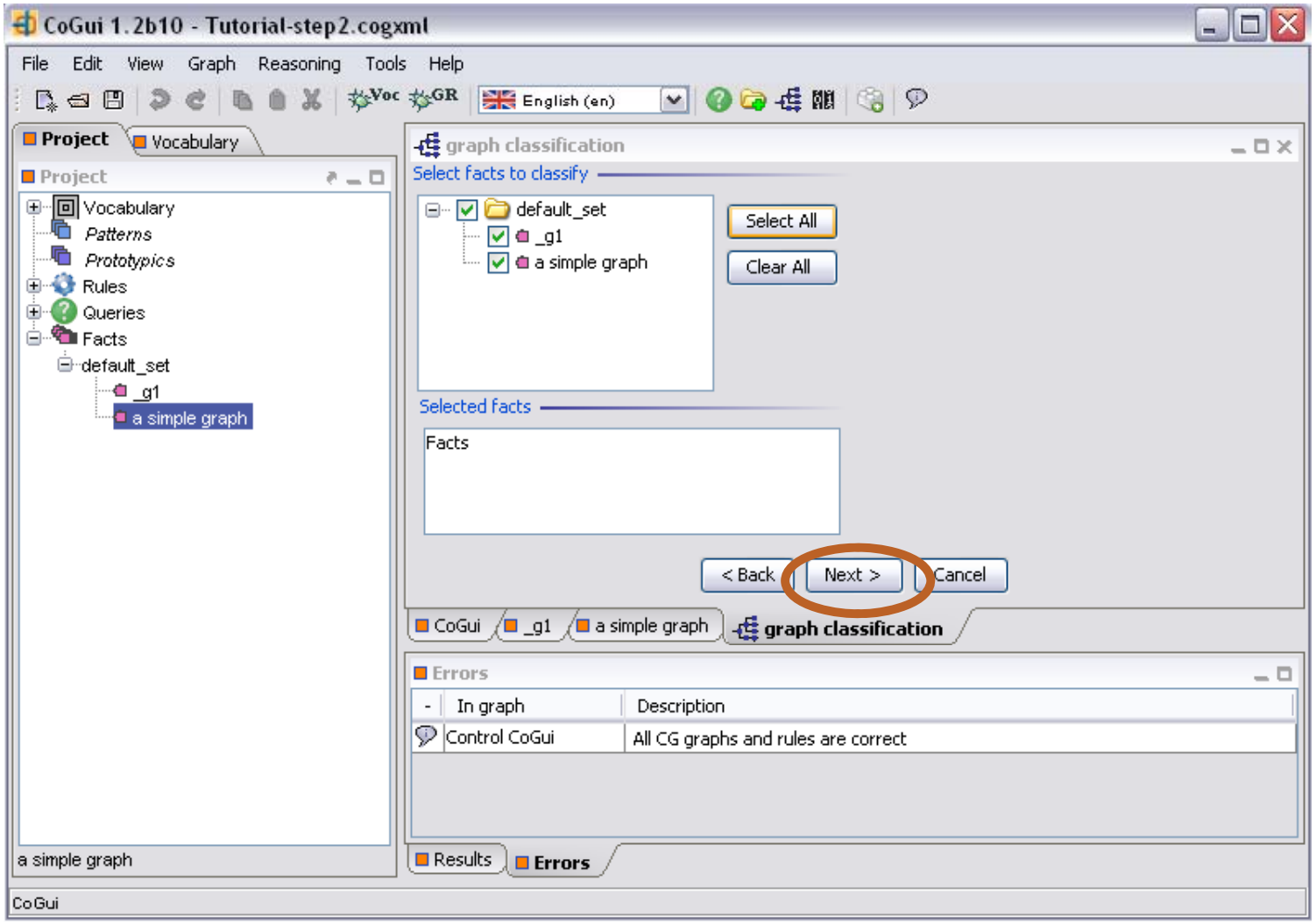
THE GRAPH CLASSIFICATION WINDOW IS OPEN



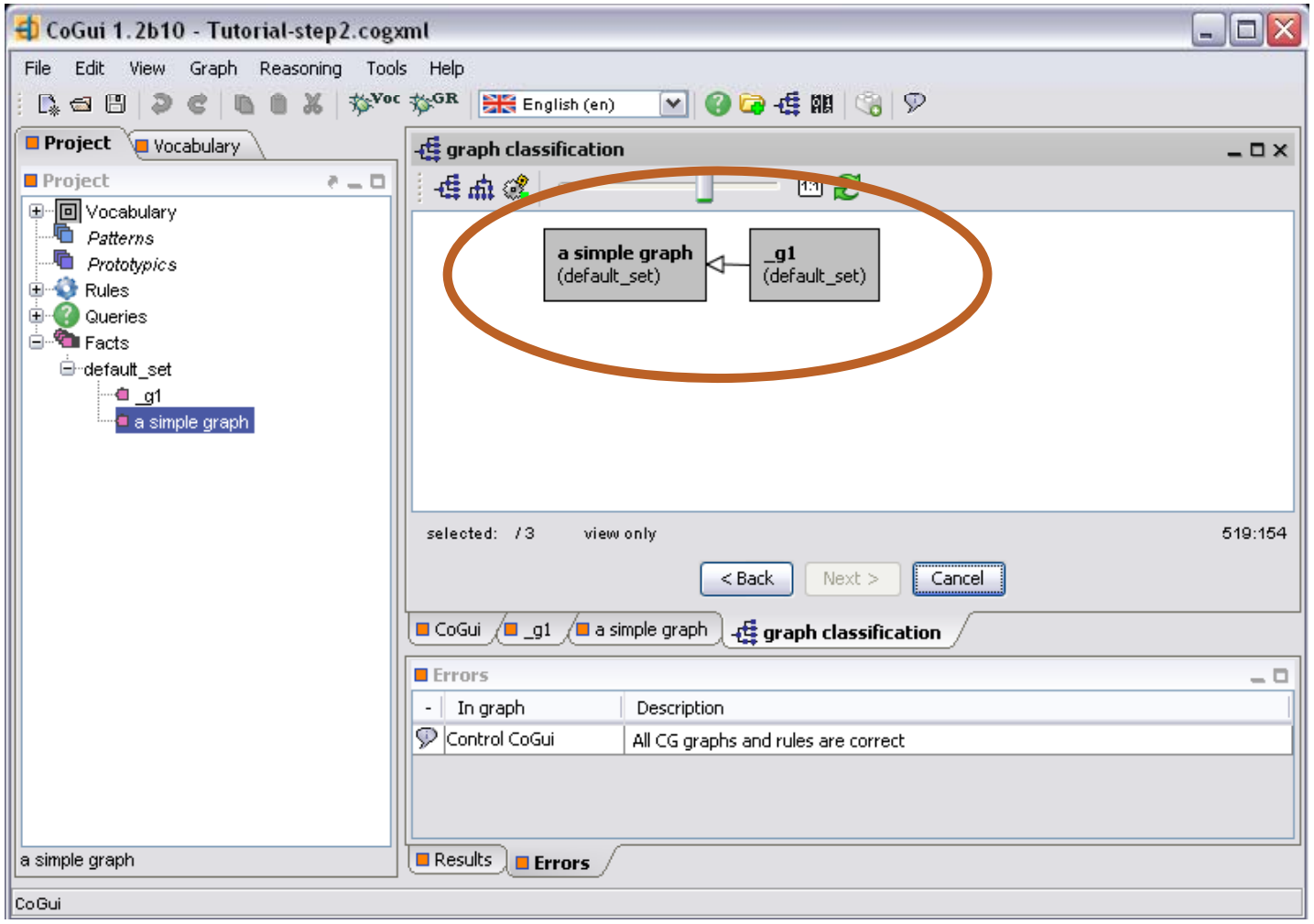
SELECT ALL YOUR FACT GRAPHS FOR CLASSIFICATION



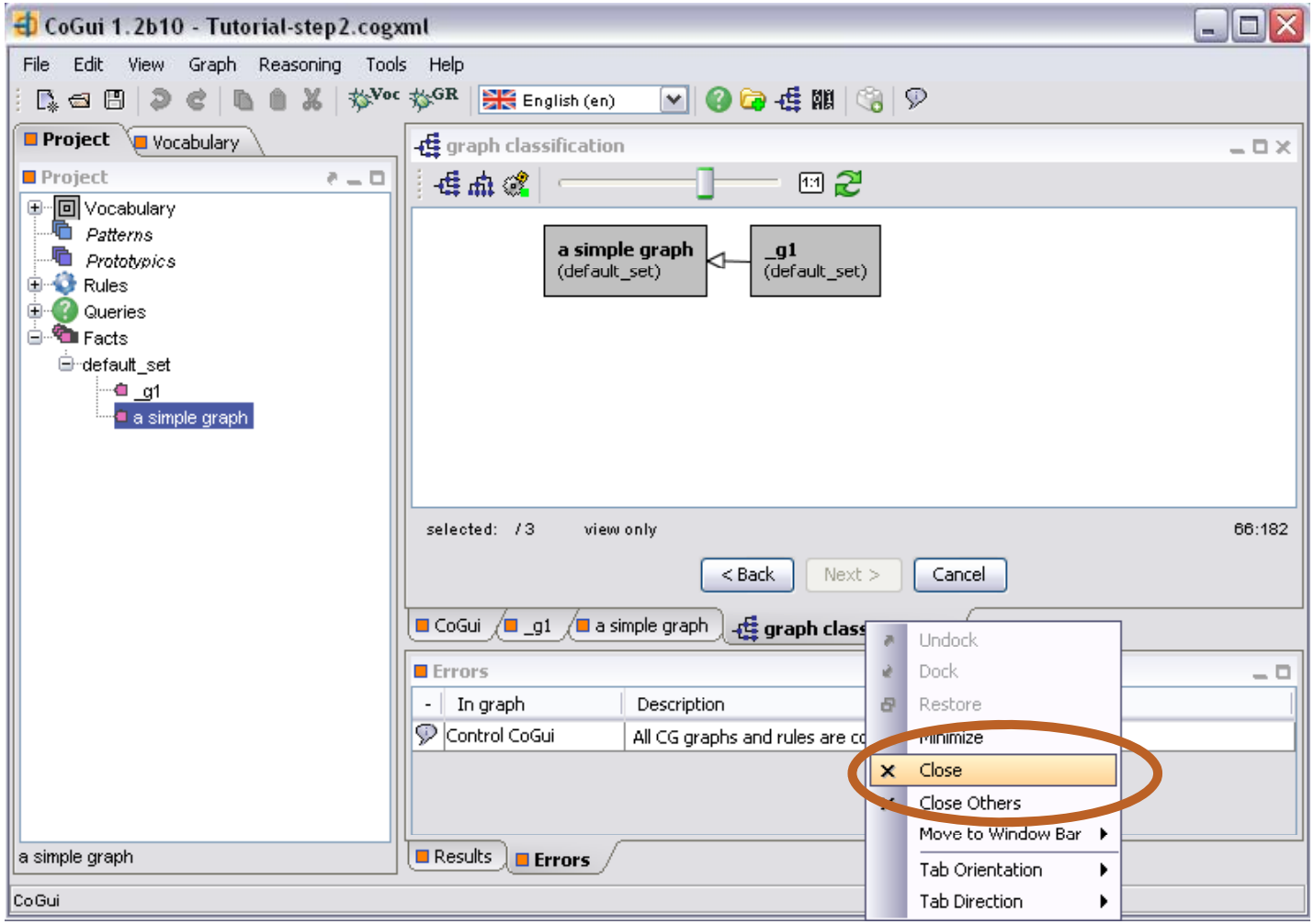
When the fact graphs you want to classify are selected click next



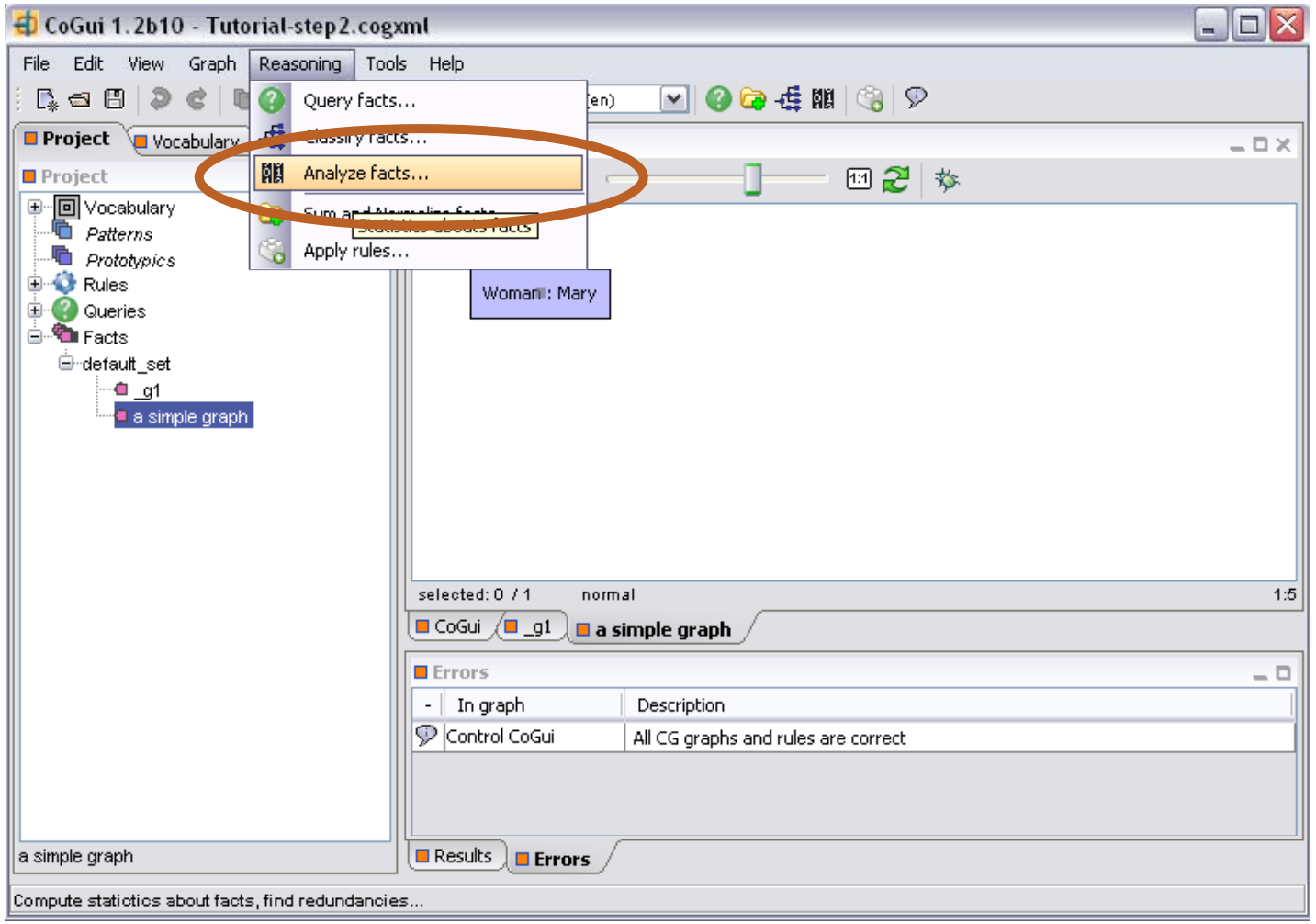
THE GRAPHS ARE SHOWN IN THEIR GENERALIZATION / SPECIALIZATION HIERARCHY



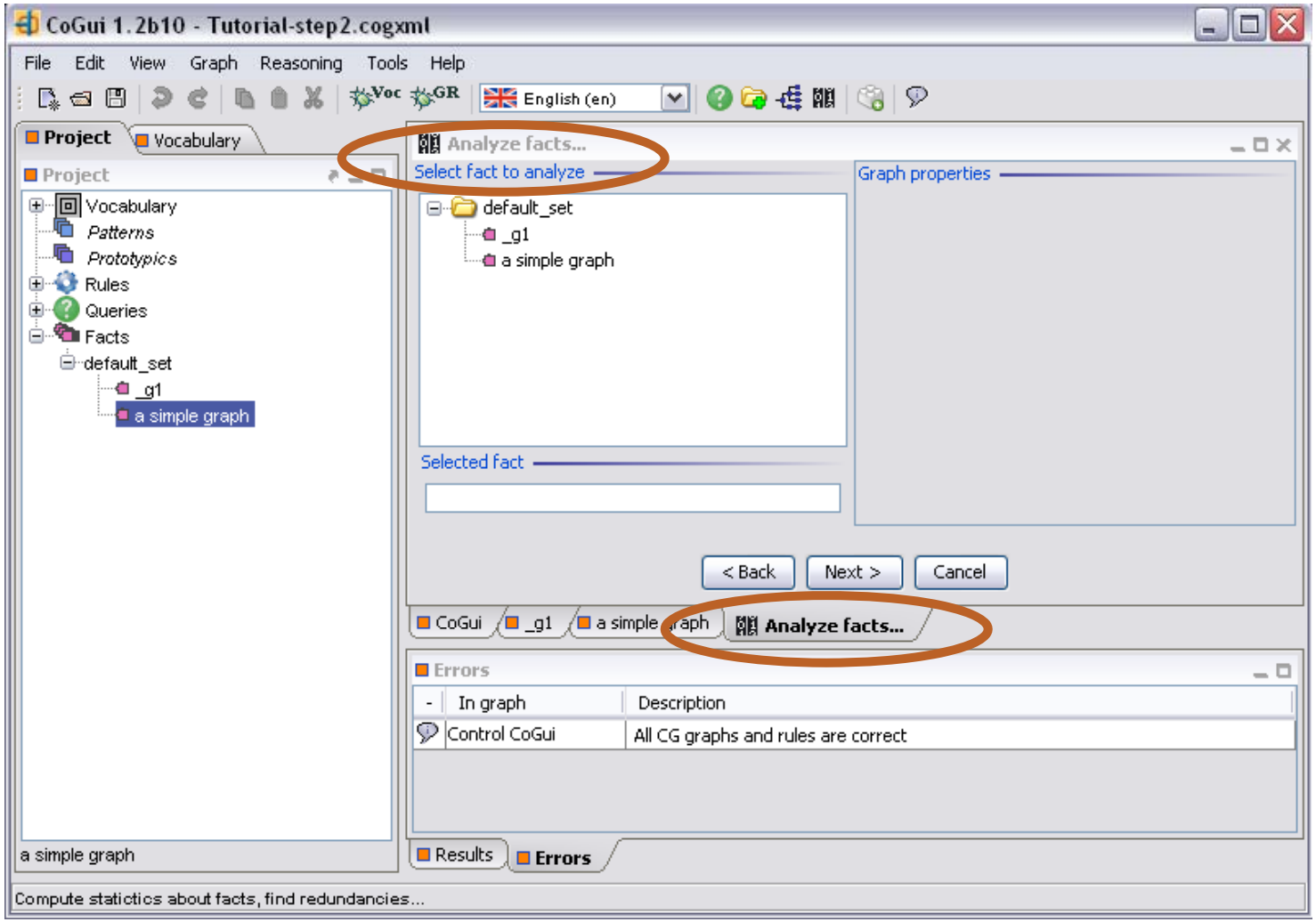
To close the graph classification window, right click then select close



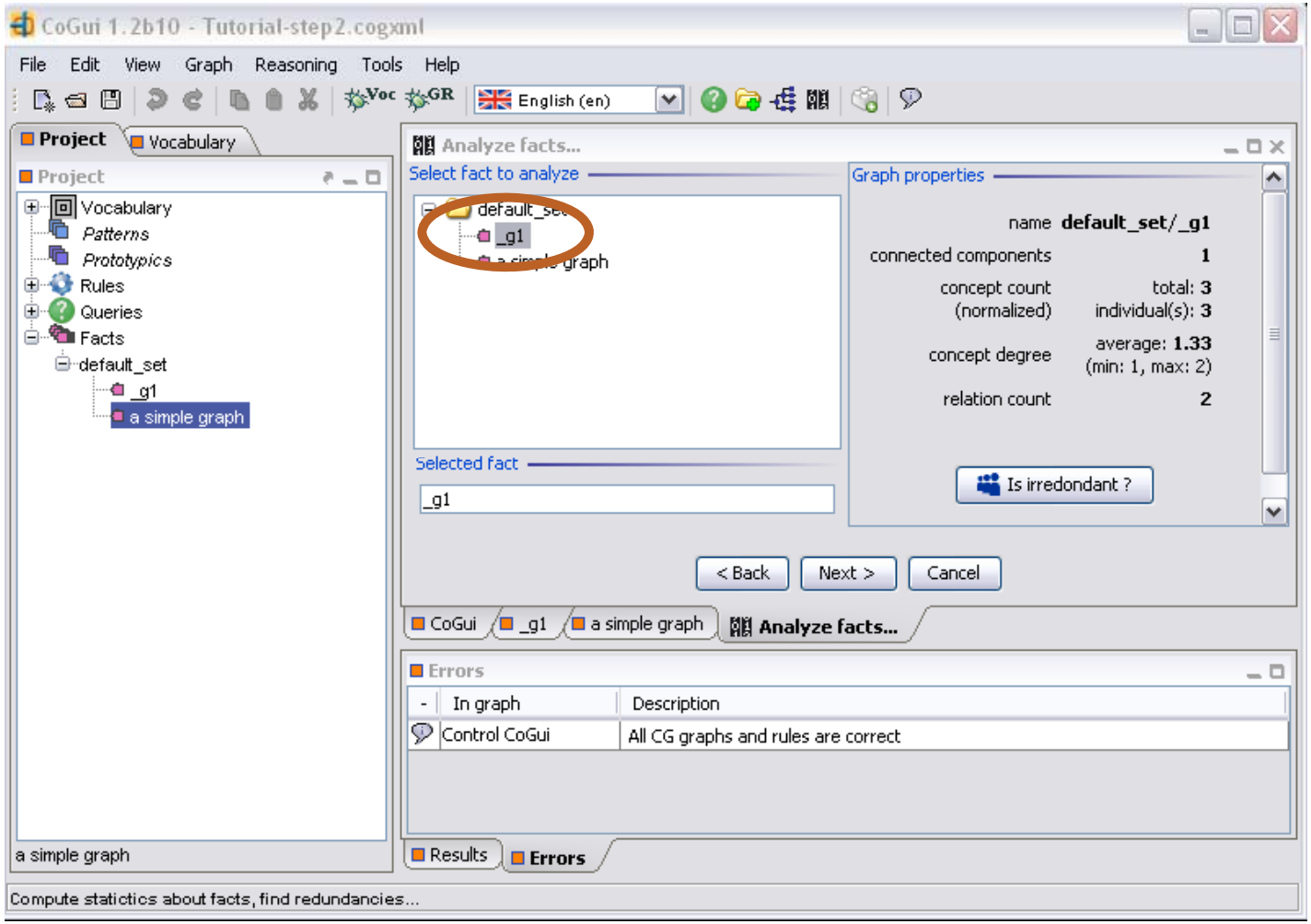
To analyze facts select Reasoning then Analyze facts



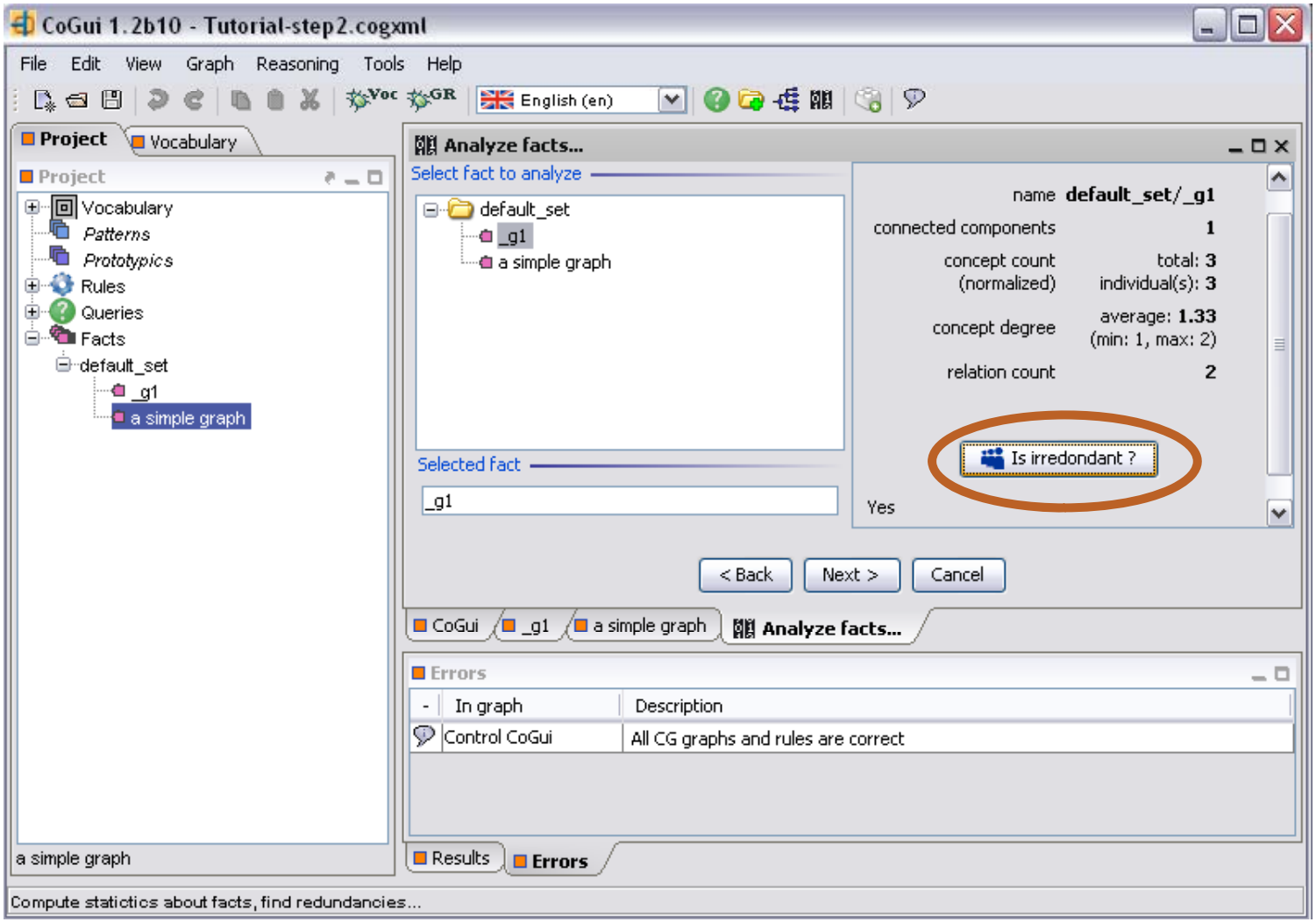
THE ANALYZE FACTS WINDOW IS NOW OPEN



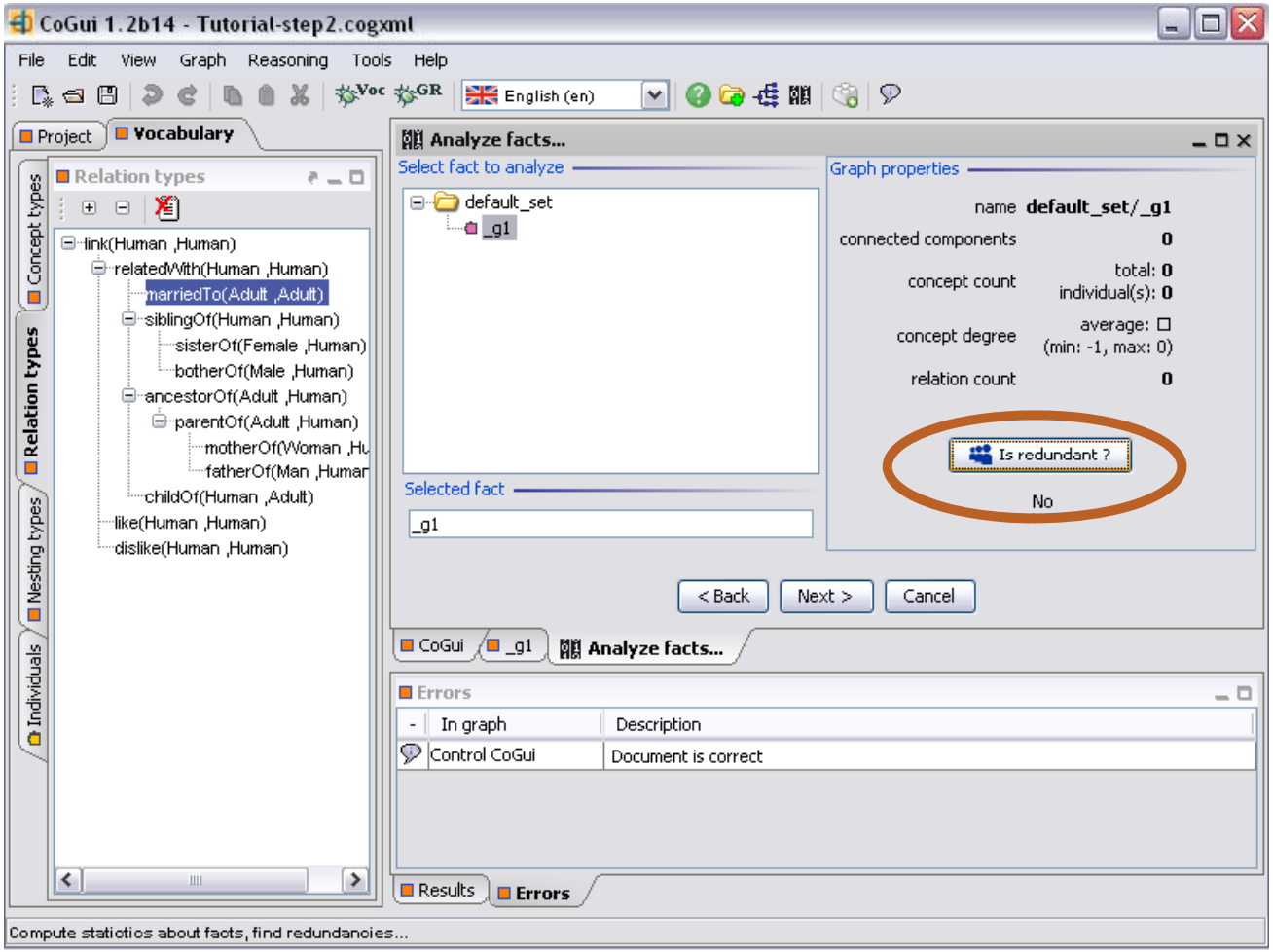
SELECT EACH GRAPH YOU WANT TO ANALYZE ONE BY ONE AND FIND THE REQUIRED INFORMATION ON THE RIGHT



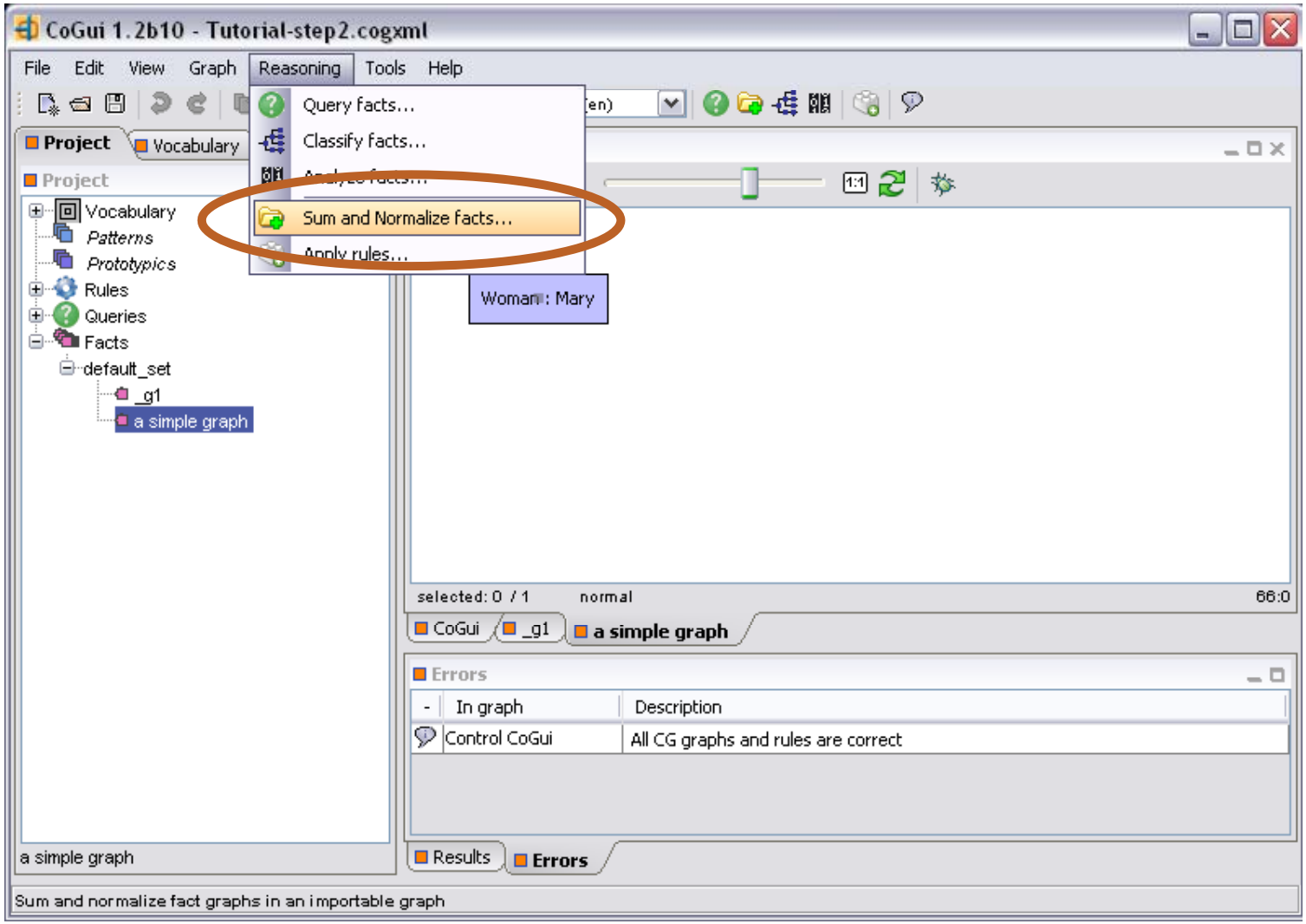
YOU CAN ALSO CHECK IF A GRAPH IS REDUNDANT



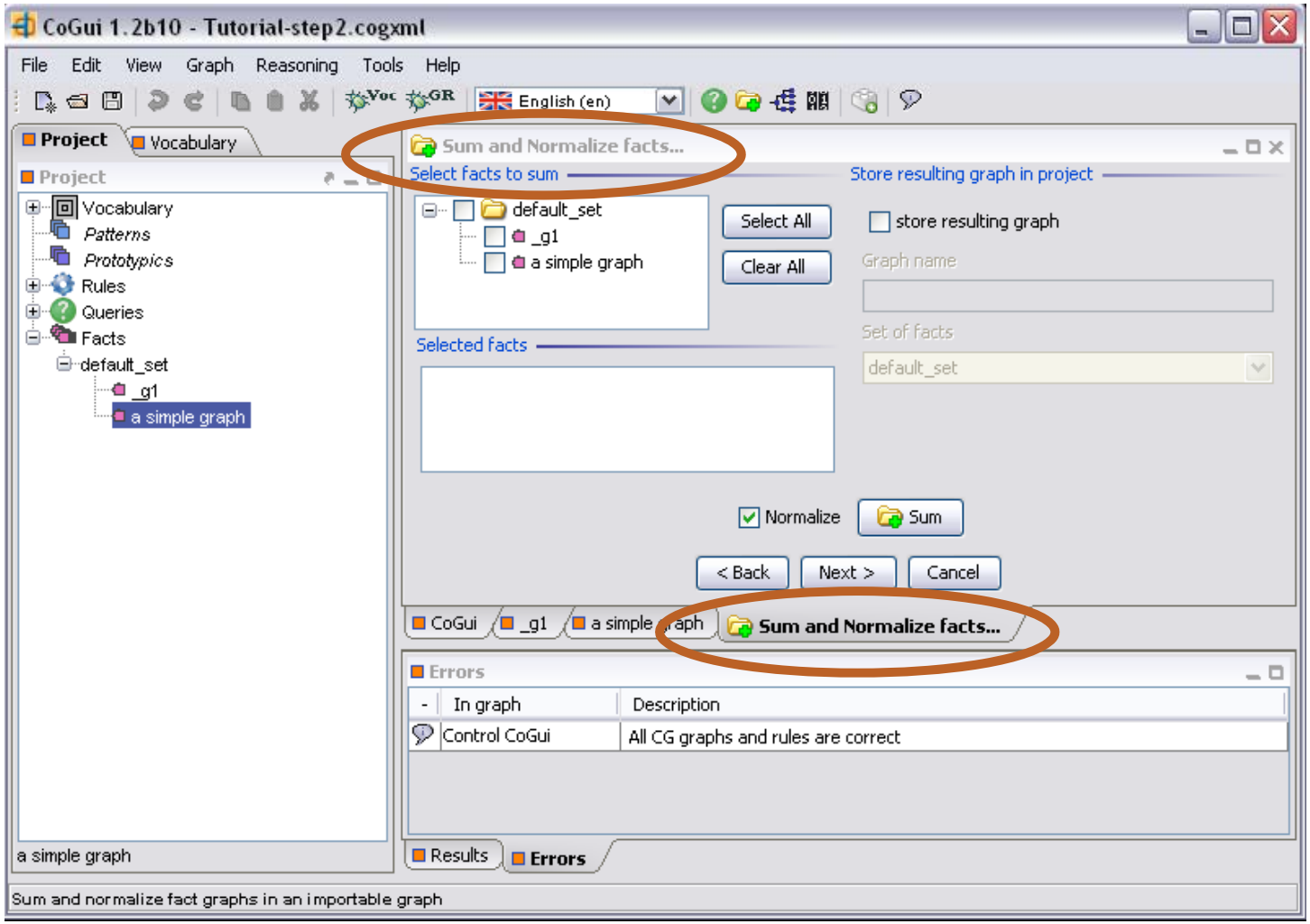
ATTENTION: THE REDUNDANCY CHECKING IS DIFFERENT IN THE NEW VERSION



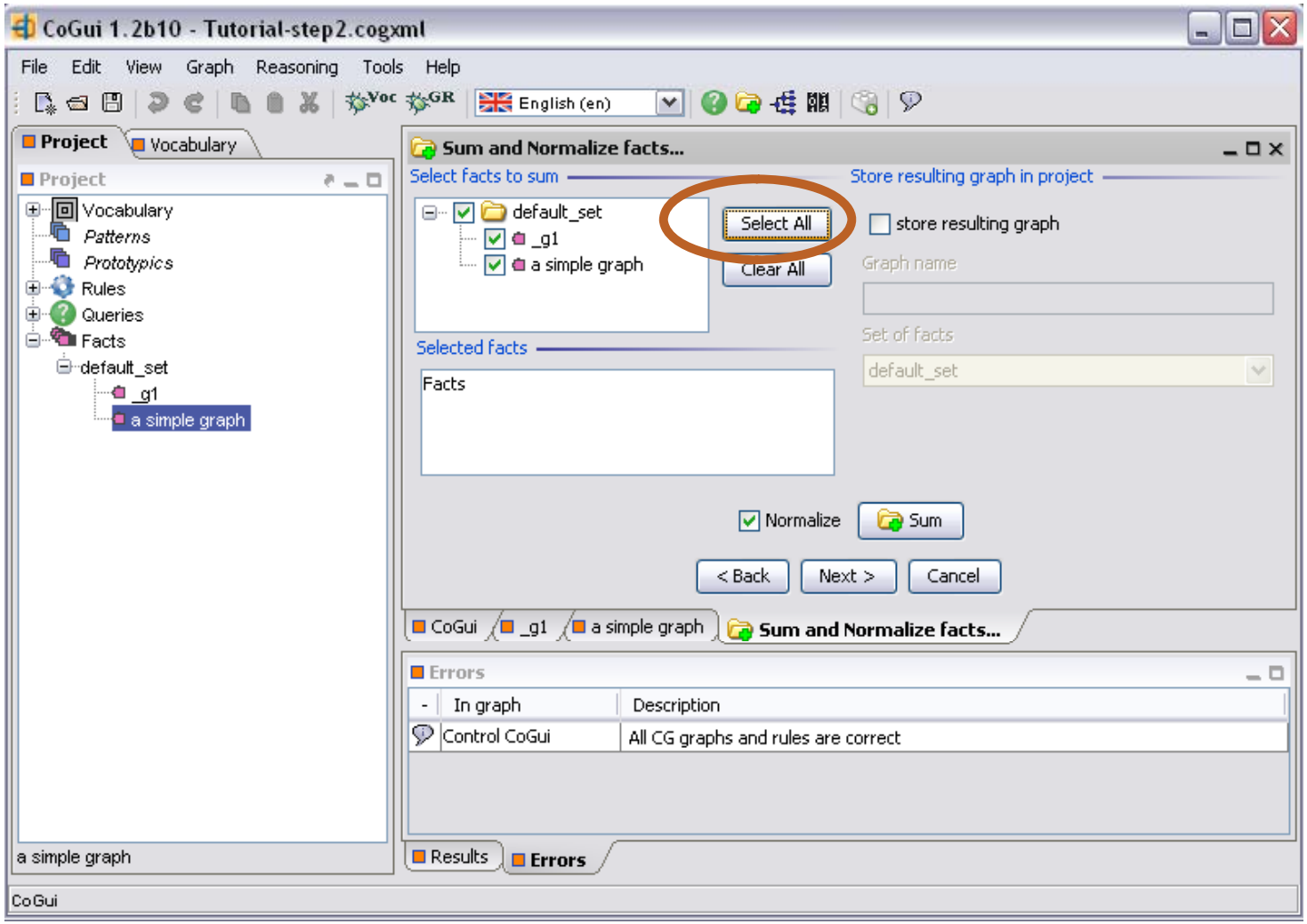
To sum (and normalize) facts select reasoning then sum and normalize facts



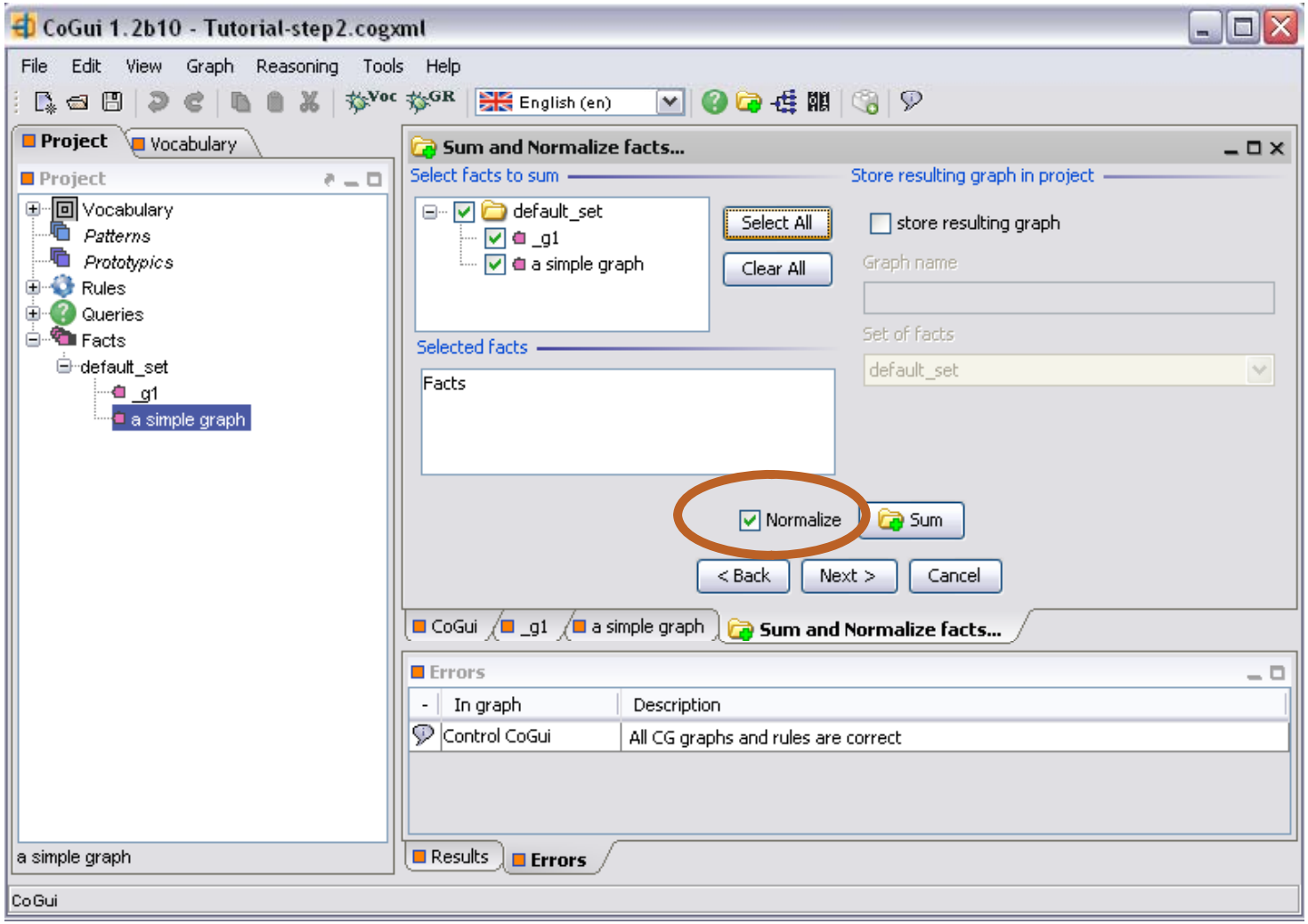
THE SUM AND NORMALIZE WINDOW IS OPEN



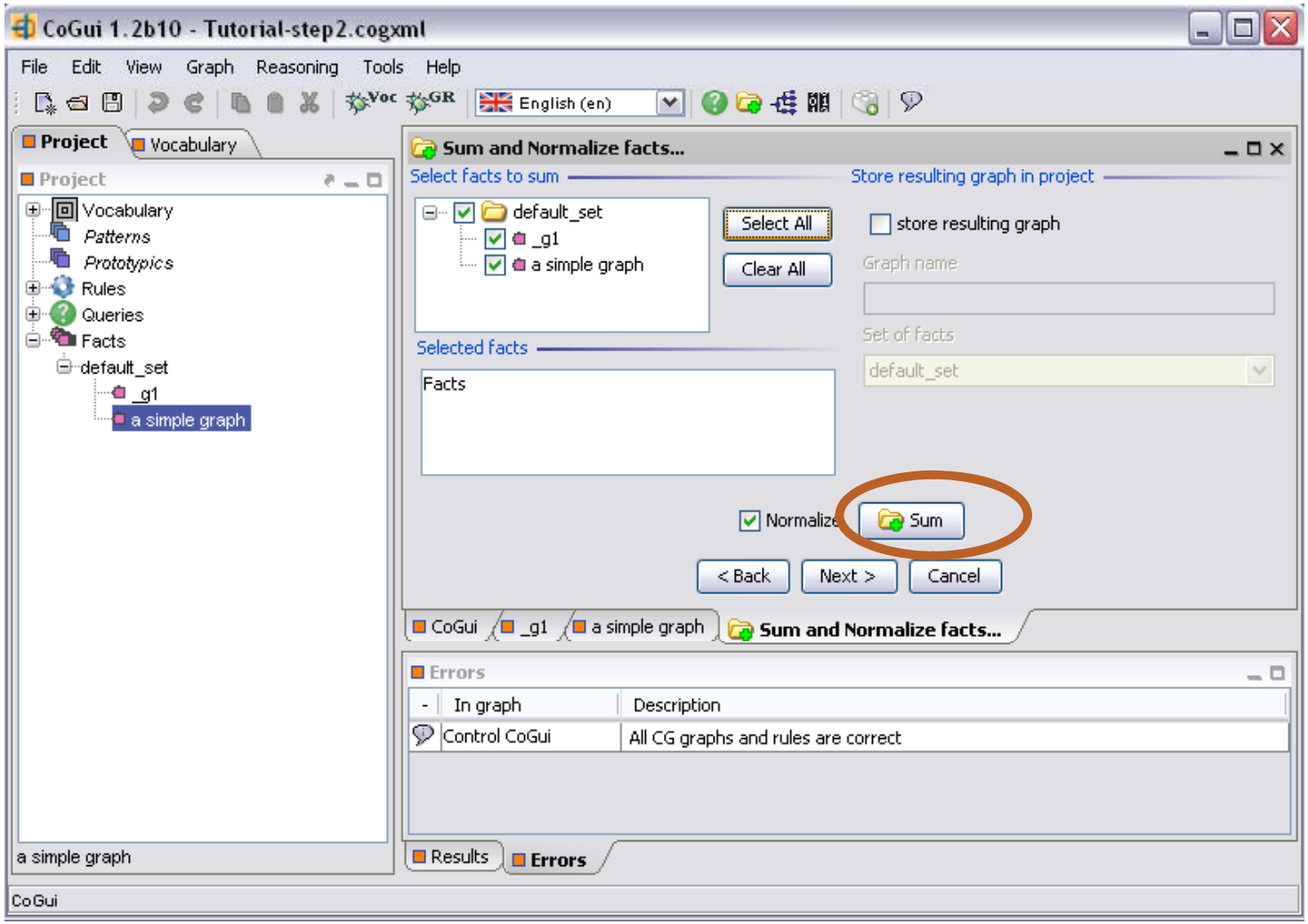
SELECT ALL THE GRAPHS YOU WANT TO SUM



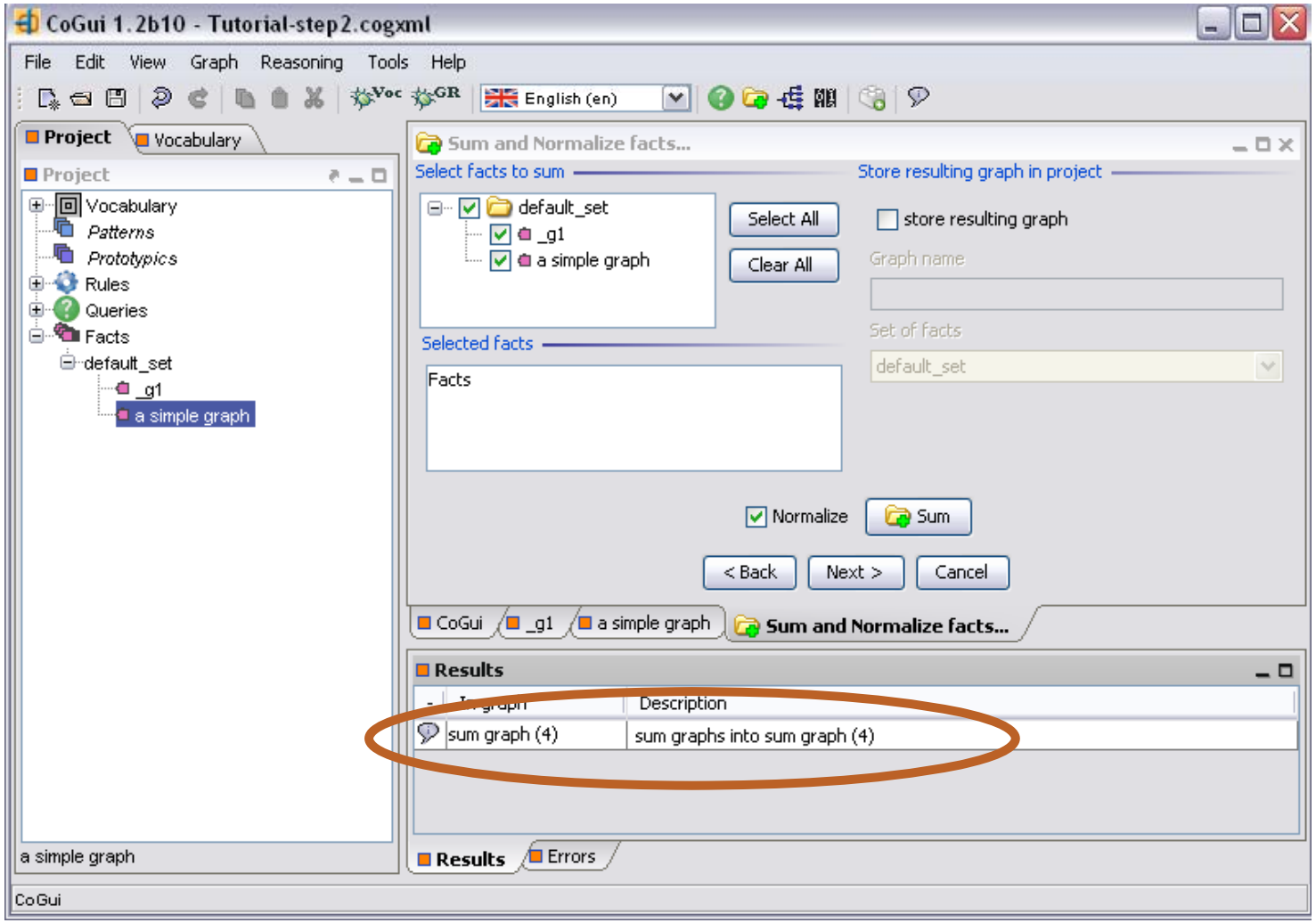
KEEP NORMALIZED CHECKED WHEN DOING THE SUM



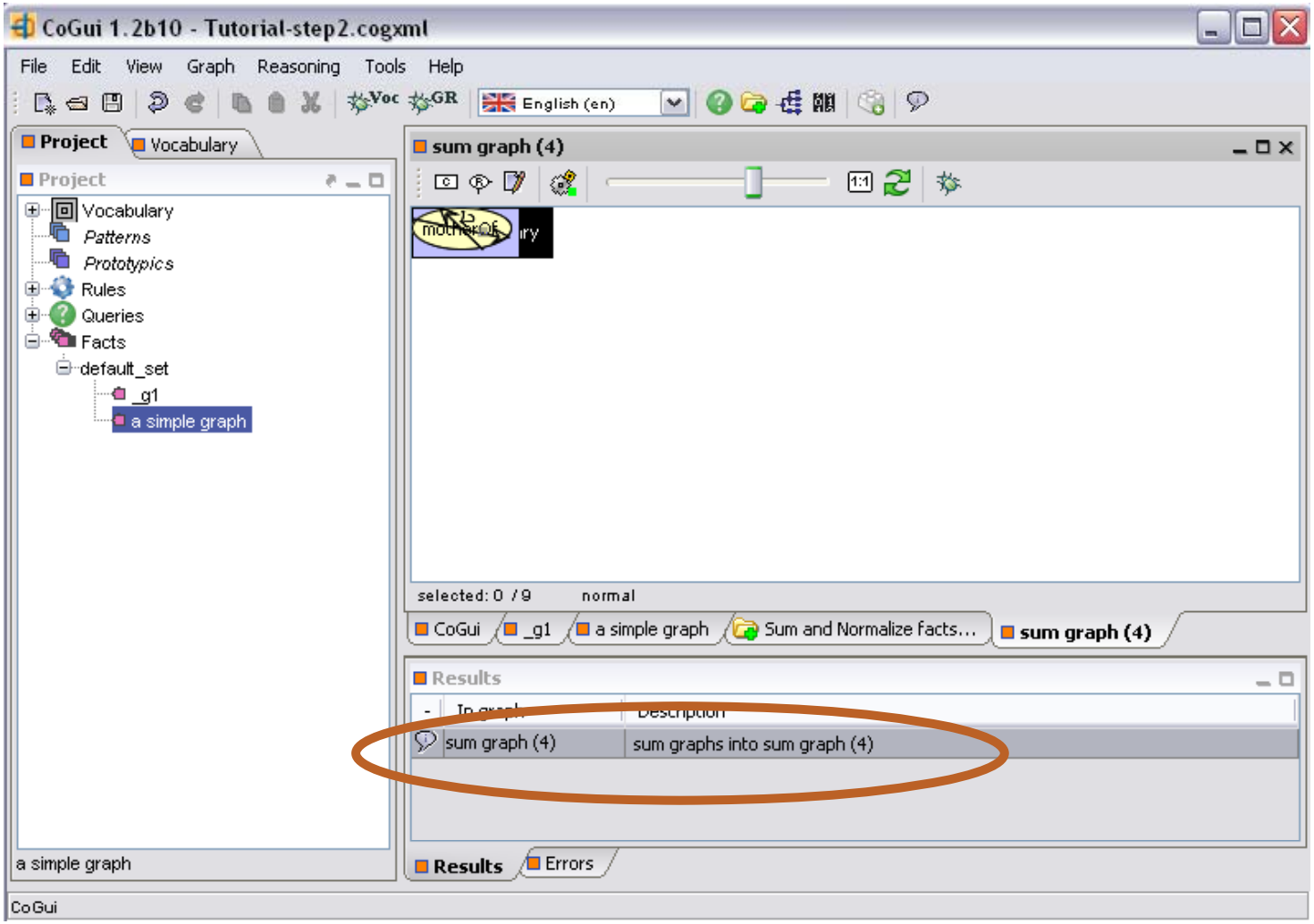
CLICK ON SUM


CoGui 1.2b10 - Tutorial-step2.cogxml
File Edit View Graph Reasoning Tools Help
English (en)
Project
Vocabulary
Vocabulary
Patterns
Prototypics
Rules
Queries
Facts
default_set
_g1
a simple graph
Sum and Normalize facts...
Select facts to sum
default_set
_g1
a simple graph
Select All
Clear All
Store resulting graph in project
store resulting graph
Graph name
Set of facts
default_set
Selected facts
Facts
Normalize
Sum
< Back
Next >
Cancel
CoGui
_g1
a simple graph
Sum and Normalize facts...
Errors
In graph
Description
Control CoGui
All CG graphs and rules are correct
Results
Errors
a simple graph
CoGui

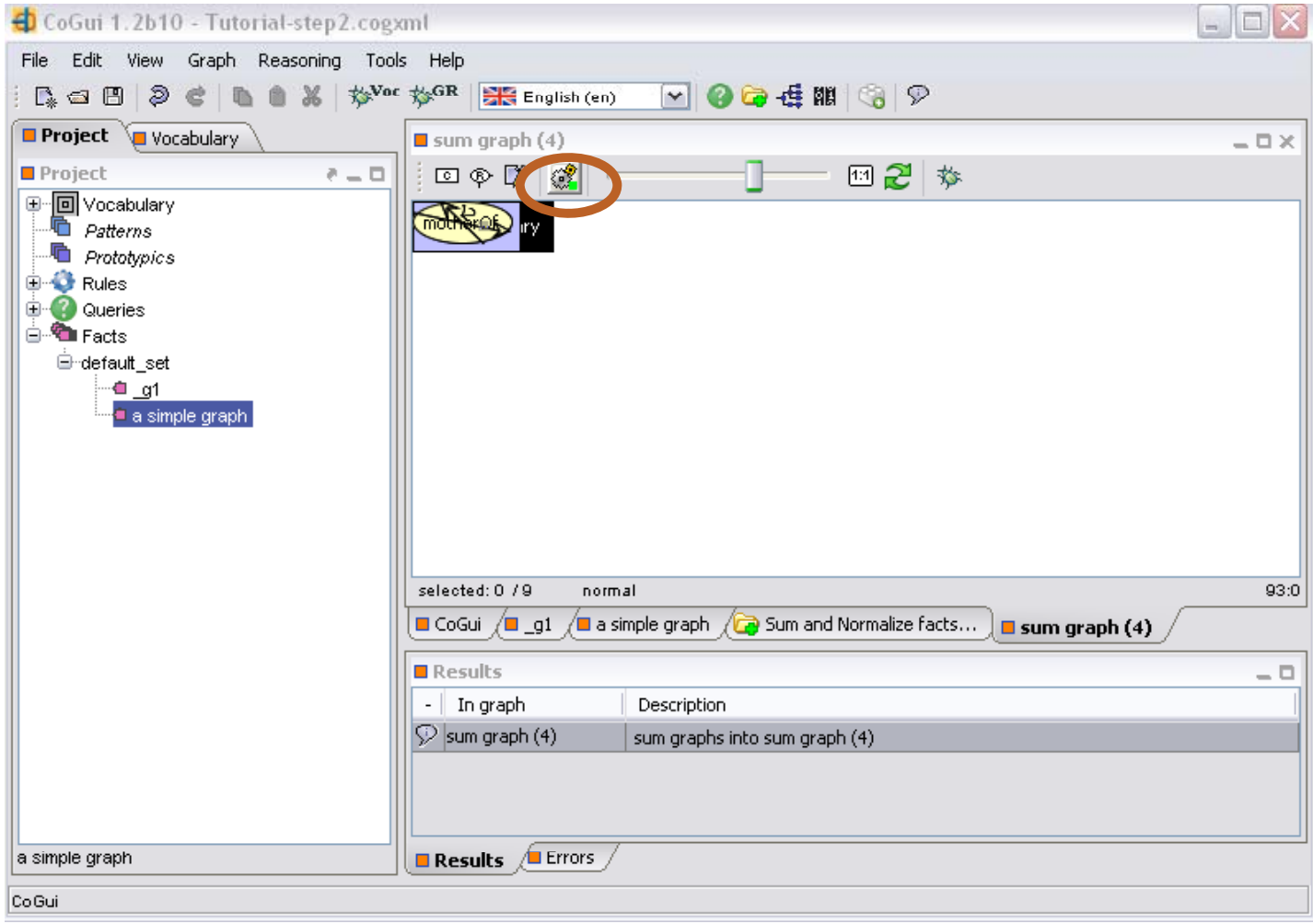
THE RESULT GRAPH IS DISPLAYED IN THE RESULTS WINDOW



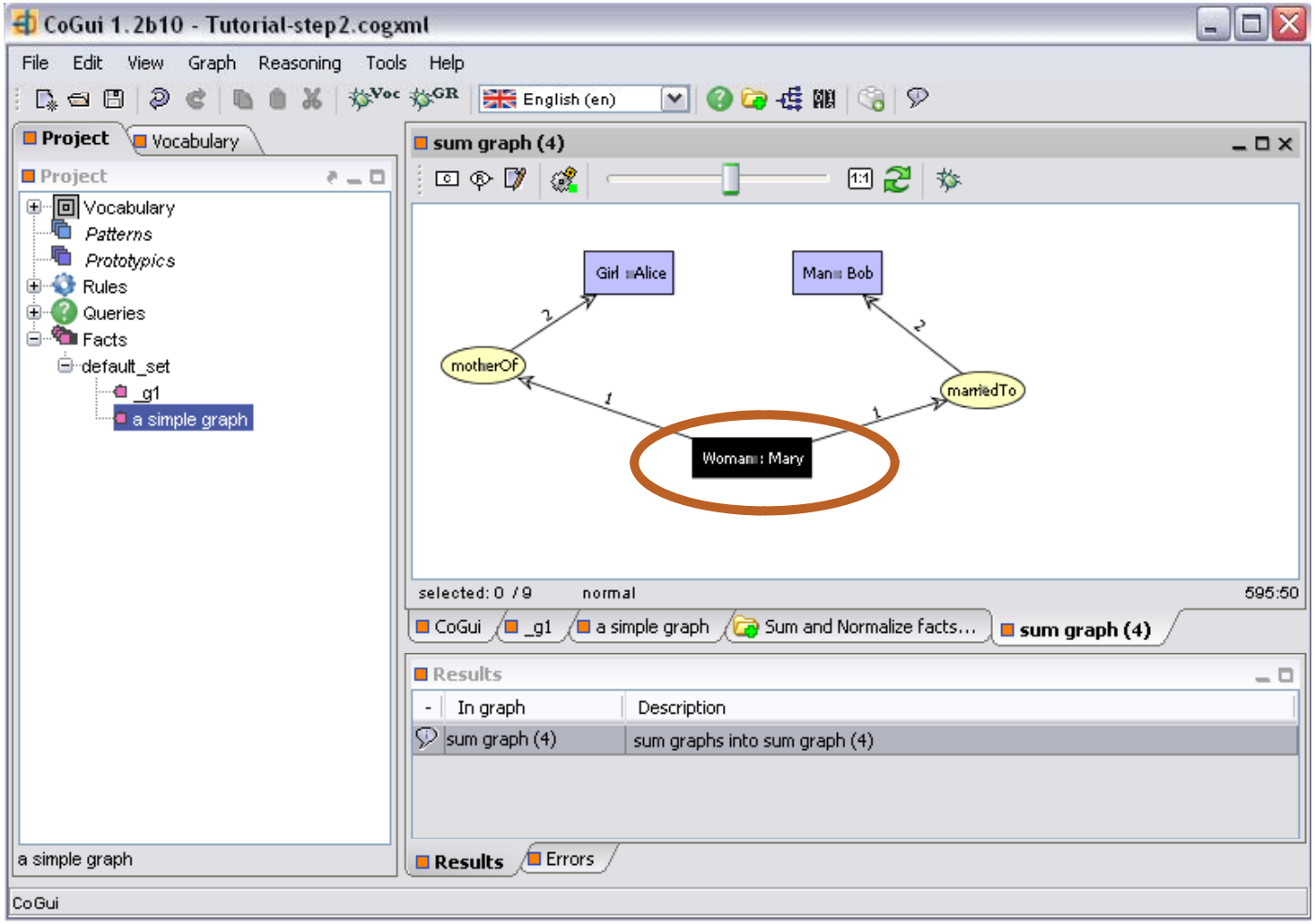
DOUBLE CLICK ON THE RESULT GRAPH



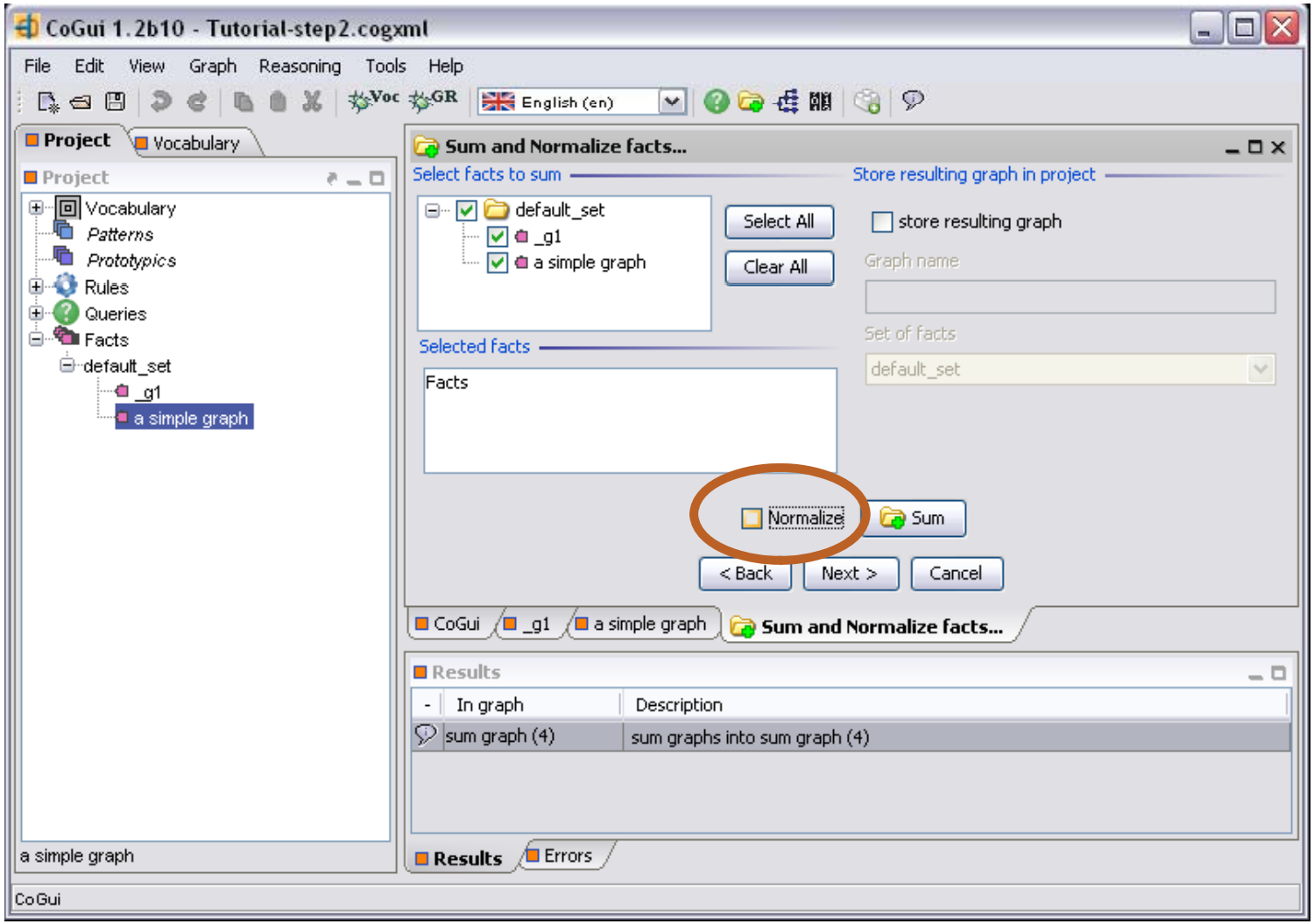
In order to better visualize the graph click on arrange graph



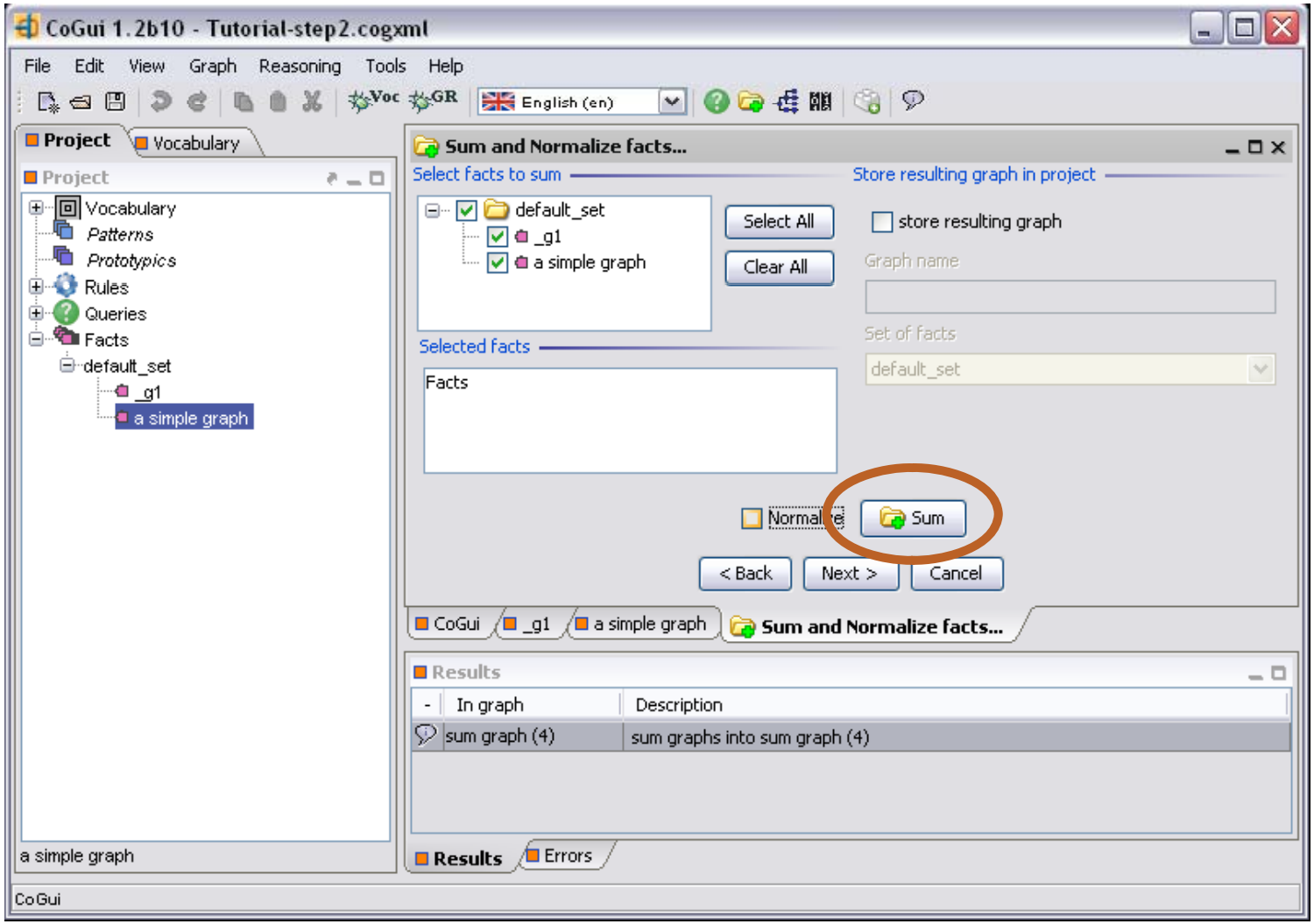
Because you normalized the sum graph the nodes woman:Mary have been merged



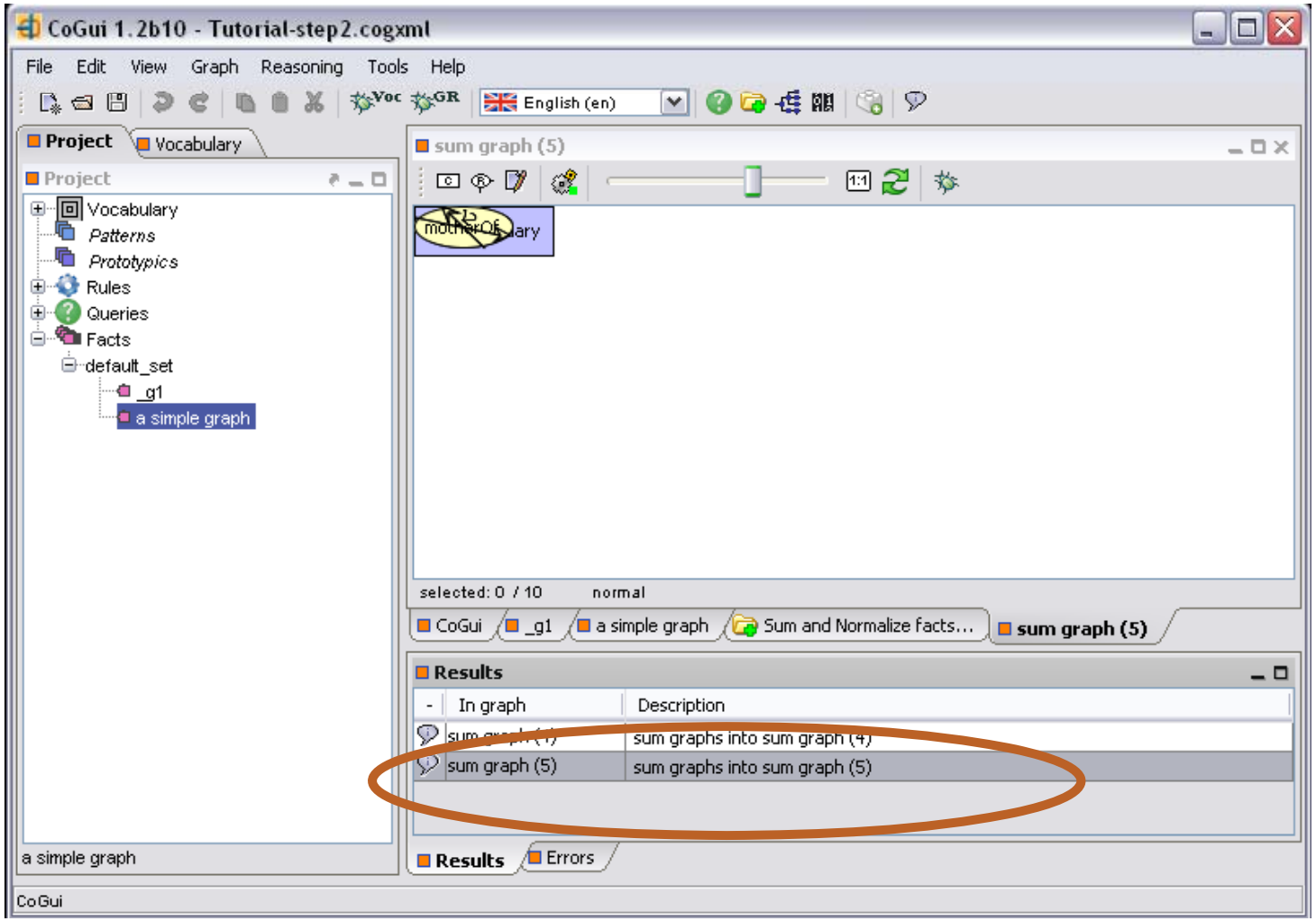
IF YOU DO NOT CHECK NORMALIZE



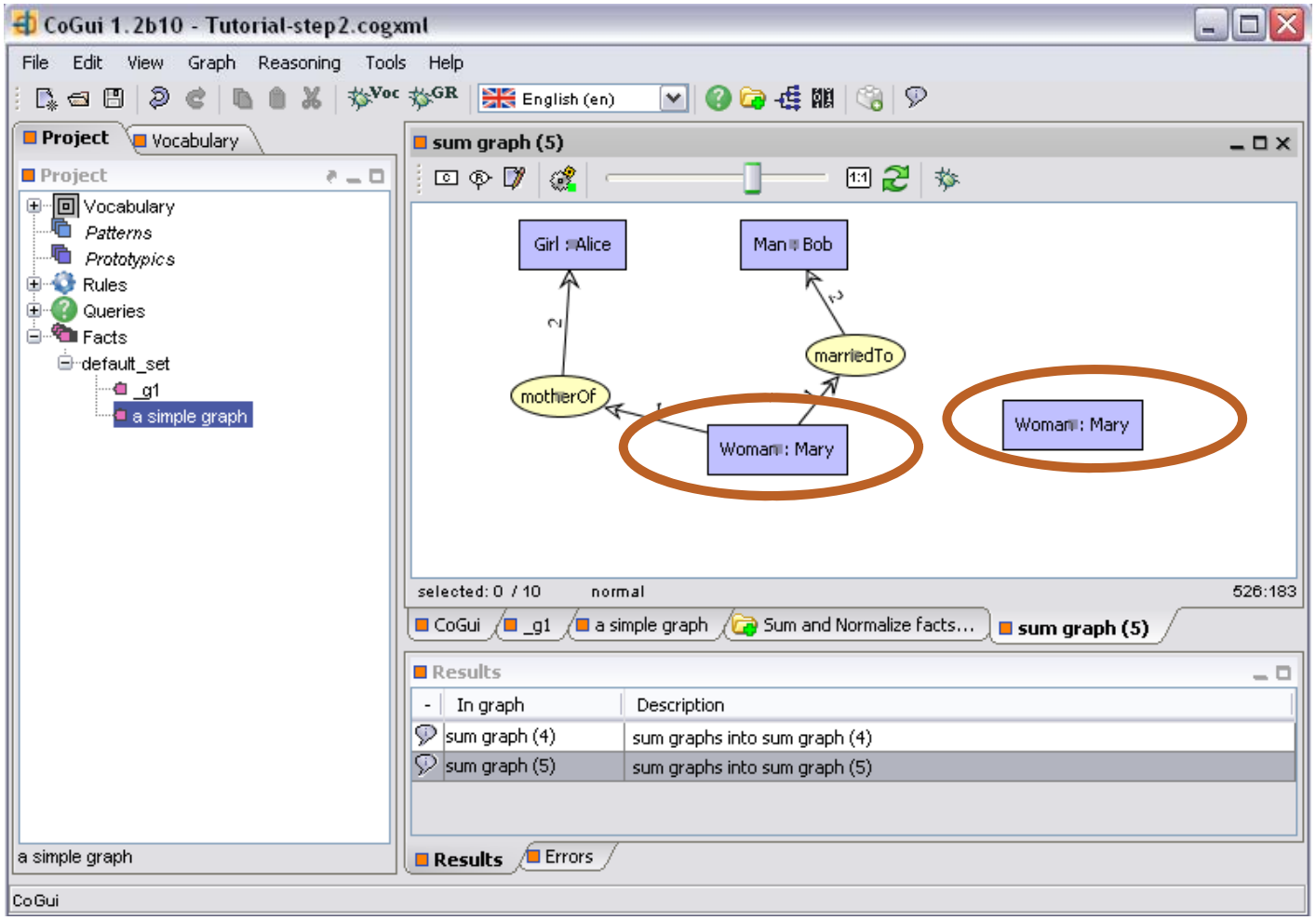
AND THEN CLICK SUM



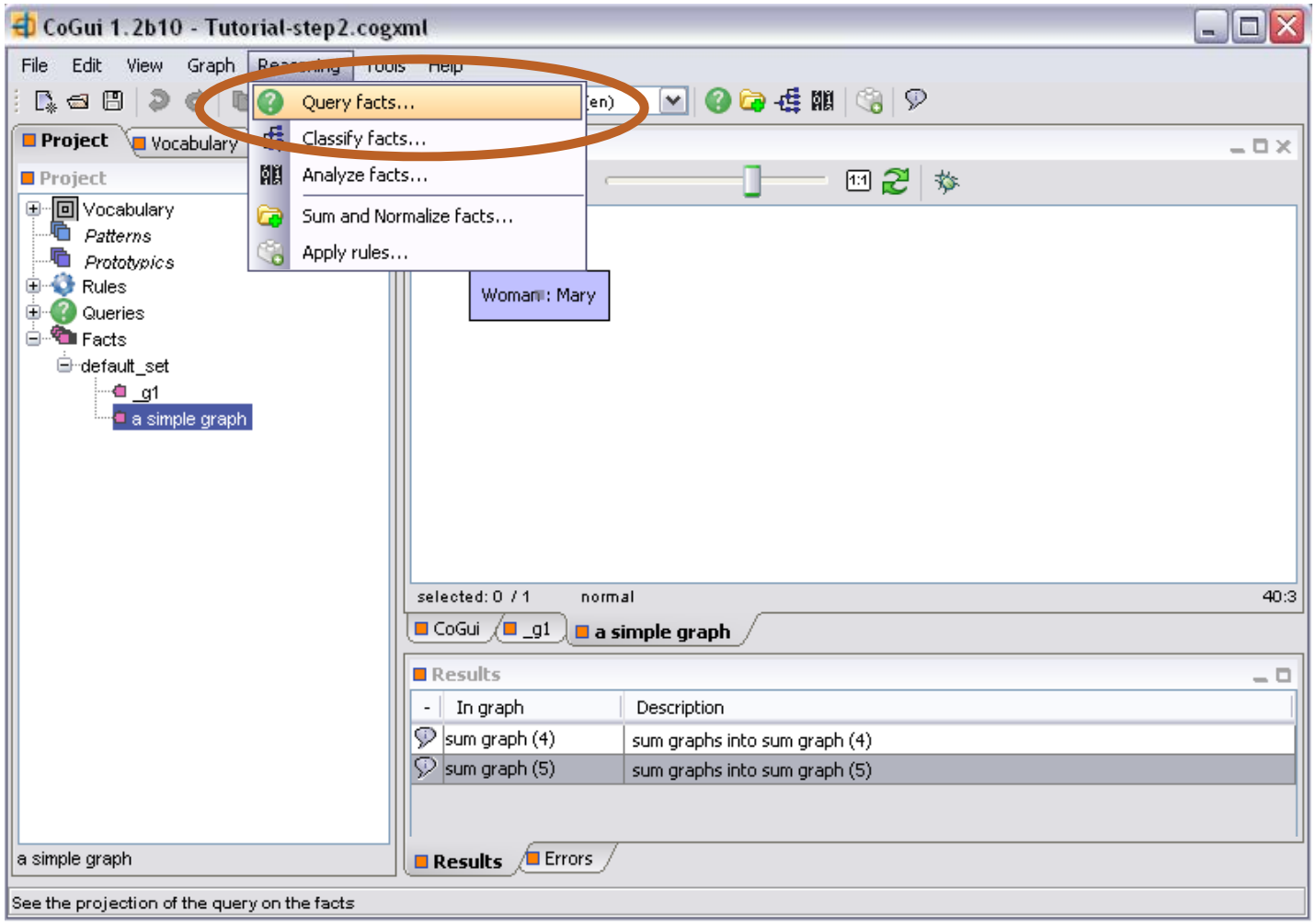
SIMILARLY THE RESULT GRAPH IS SHOWED IN THE RESULTS WINDOW



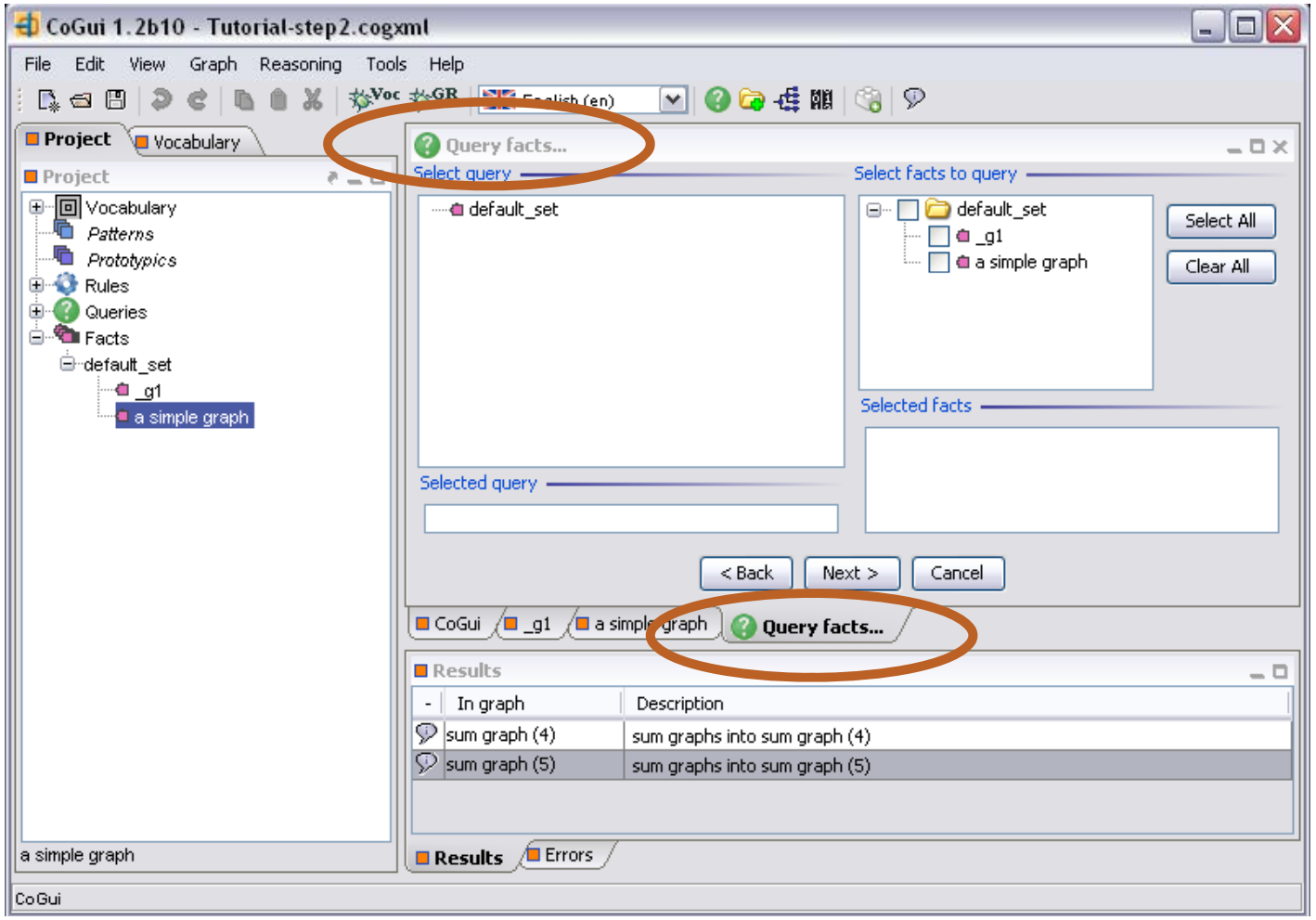
Since the graph was not normalized after the sum there are two concepts Woman: Mary



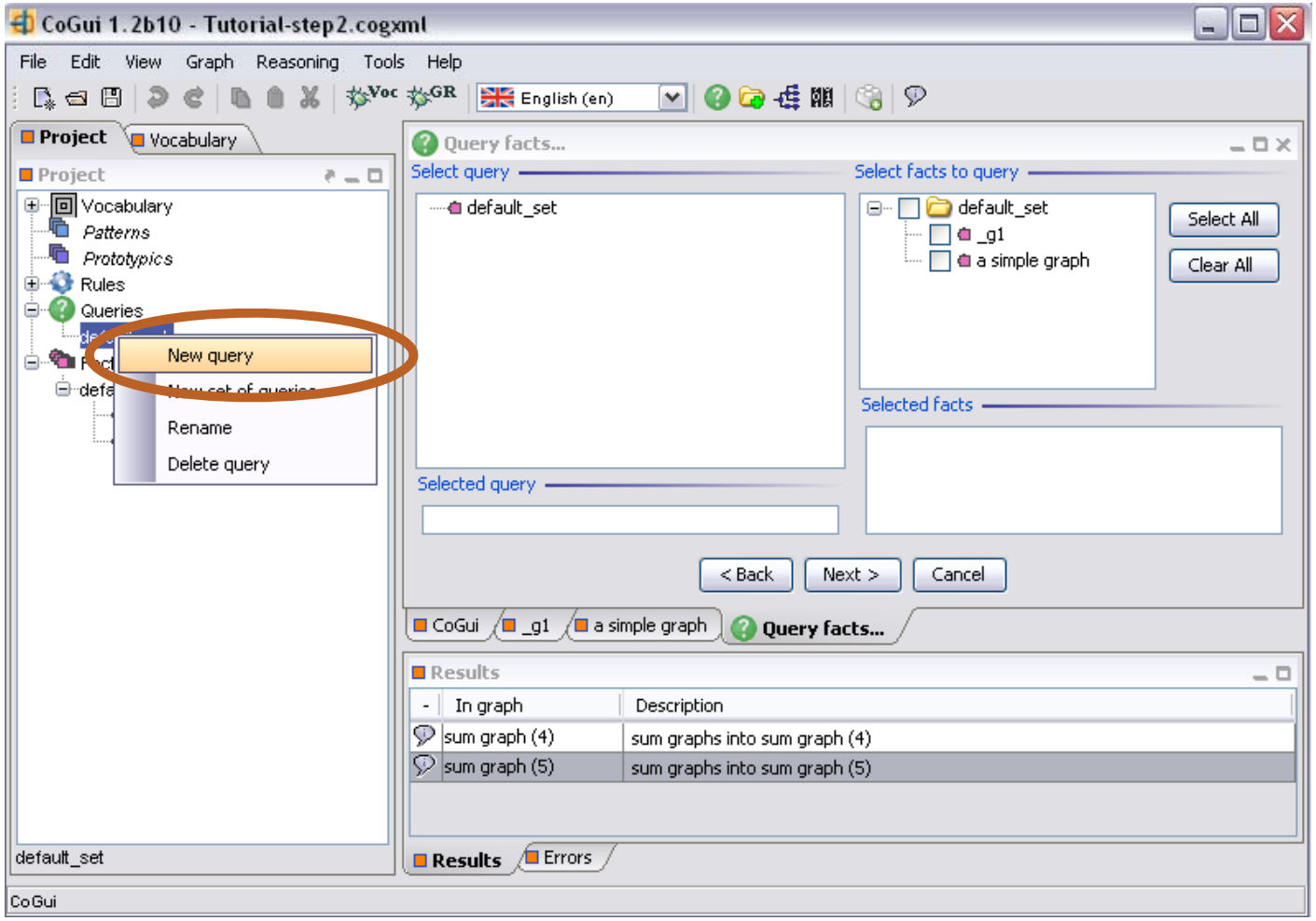
To query the knowledge base select reasoning, query facts



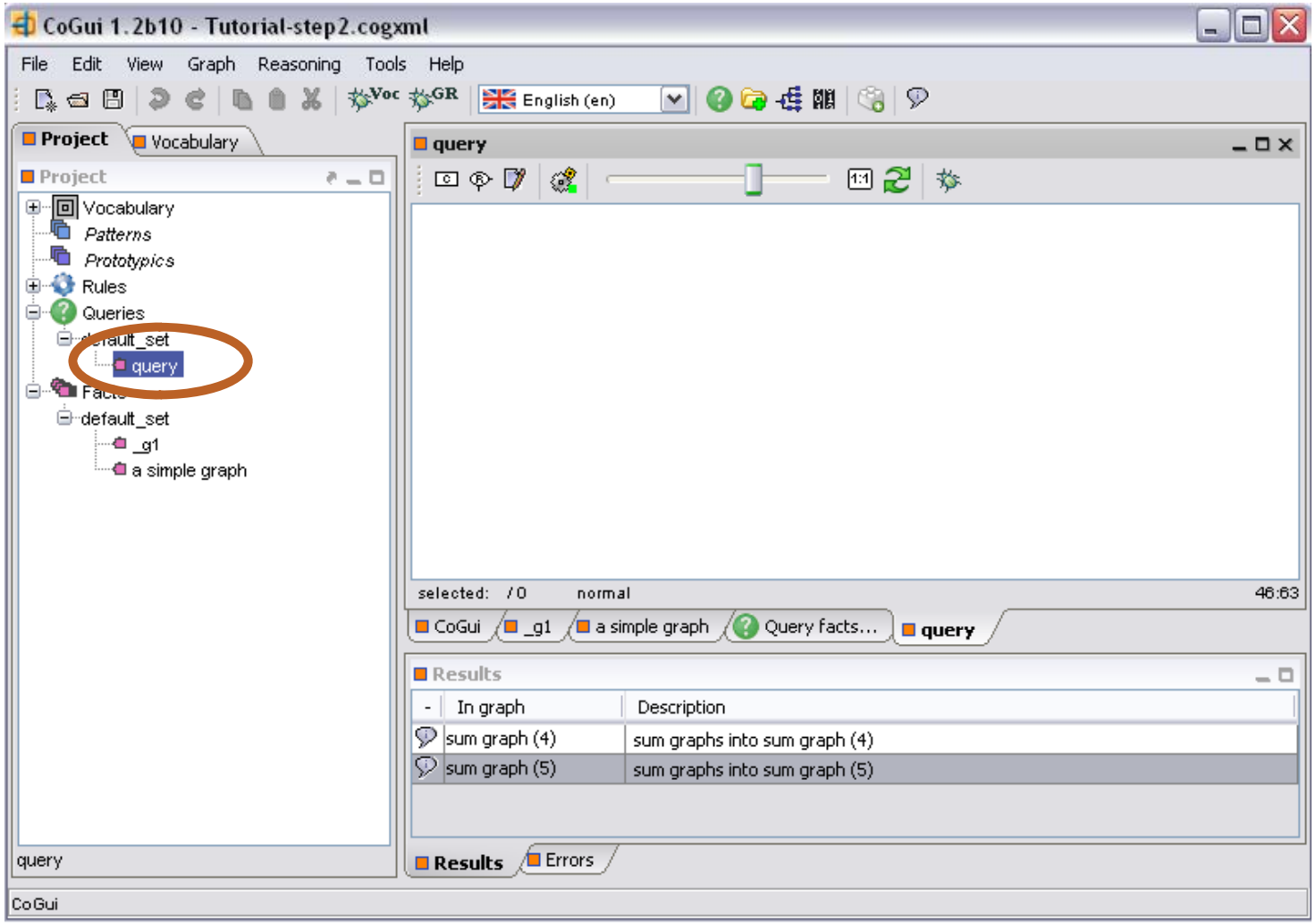
THE QUERY FACTS WINDOW IS OPEN



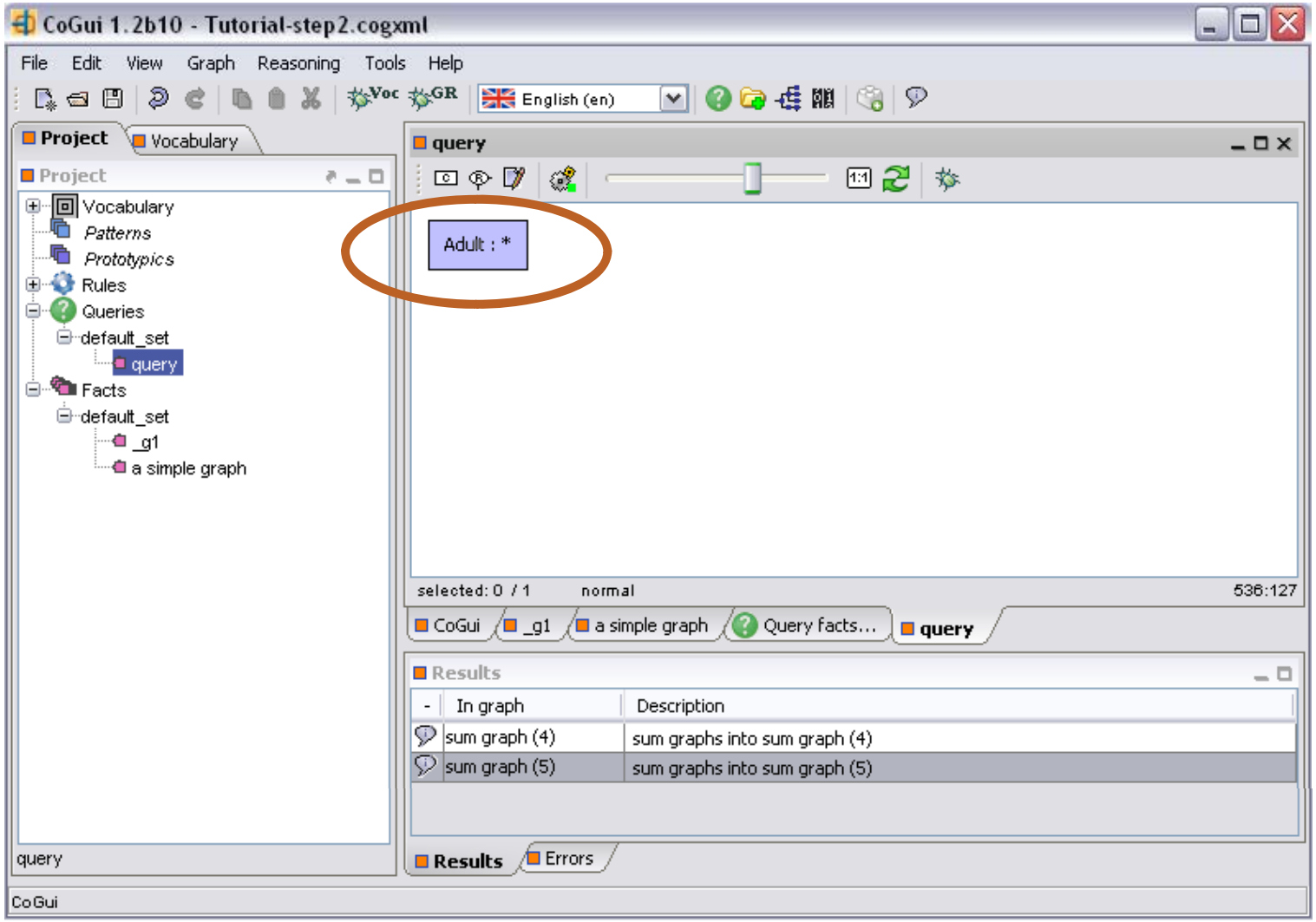
To query you will need to create a new query



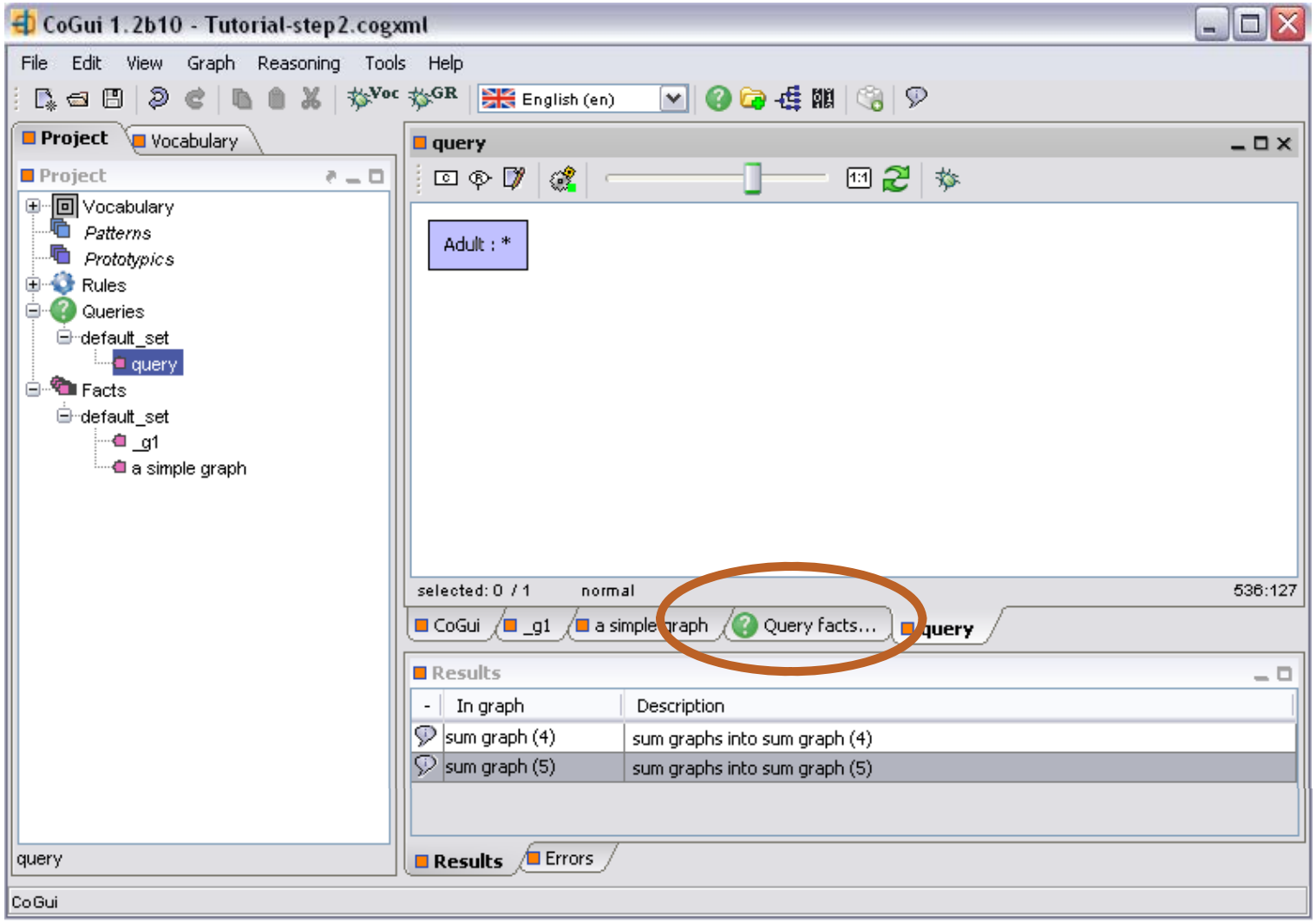
To create a query go to Project > Queries and right click on the default query set



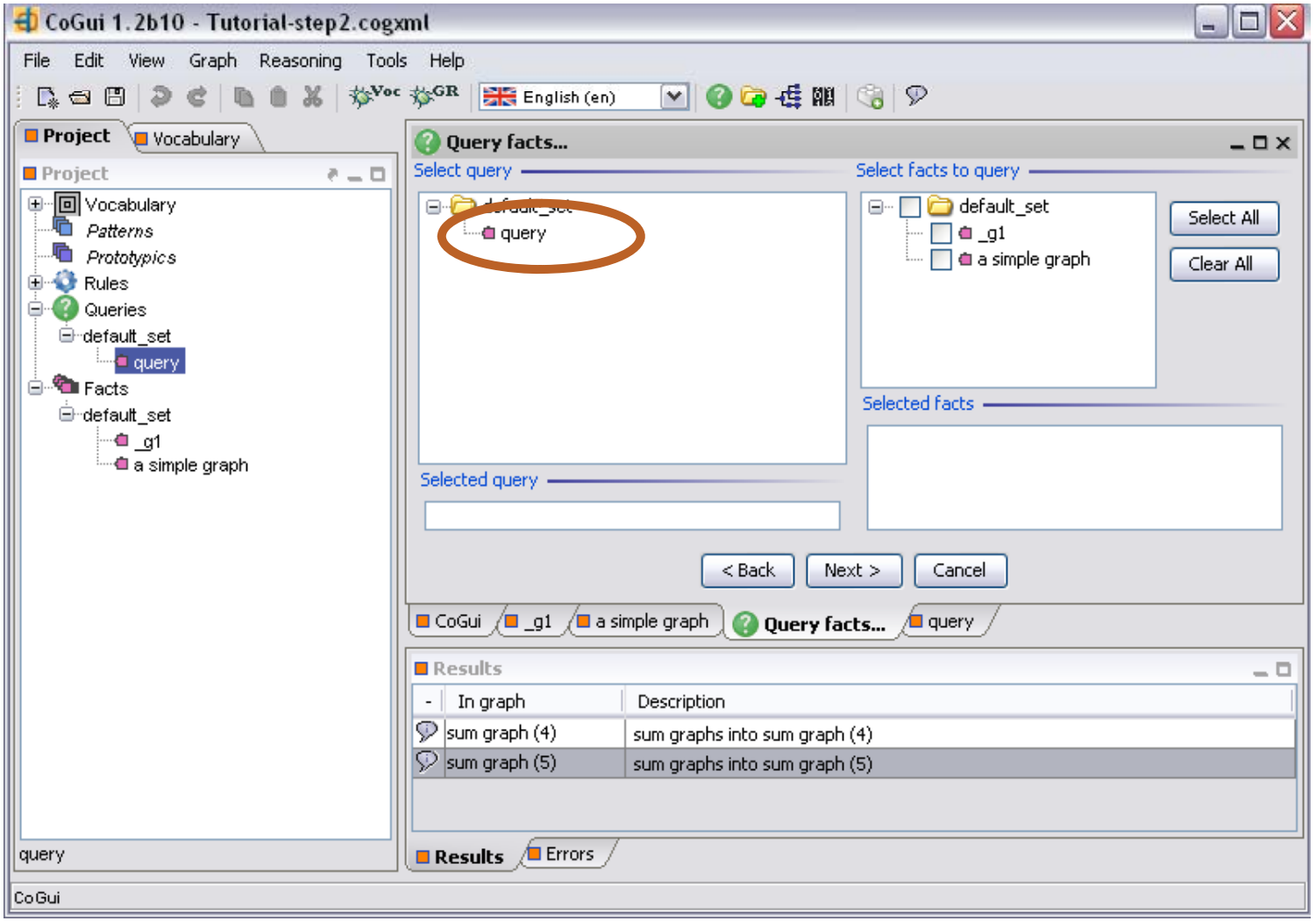
THE QUERY IS A BG – IS BUILT JUST LIKE A FACT GRAPH



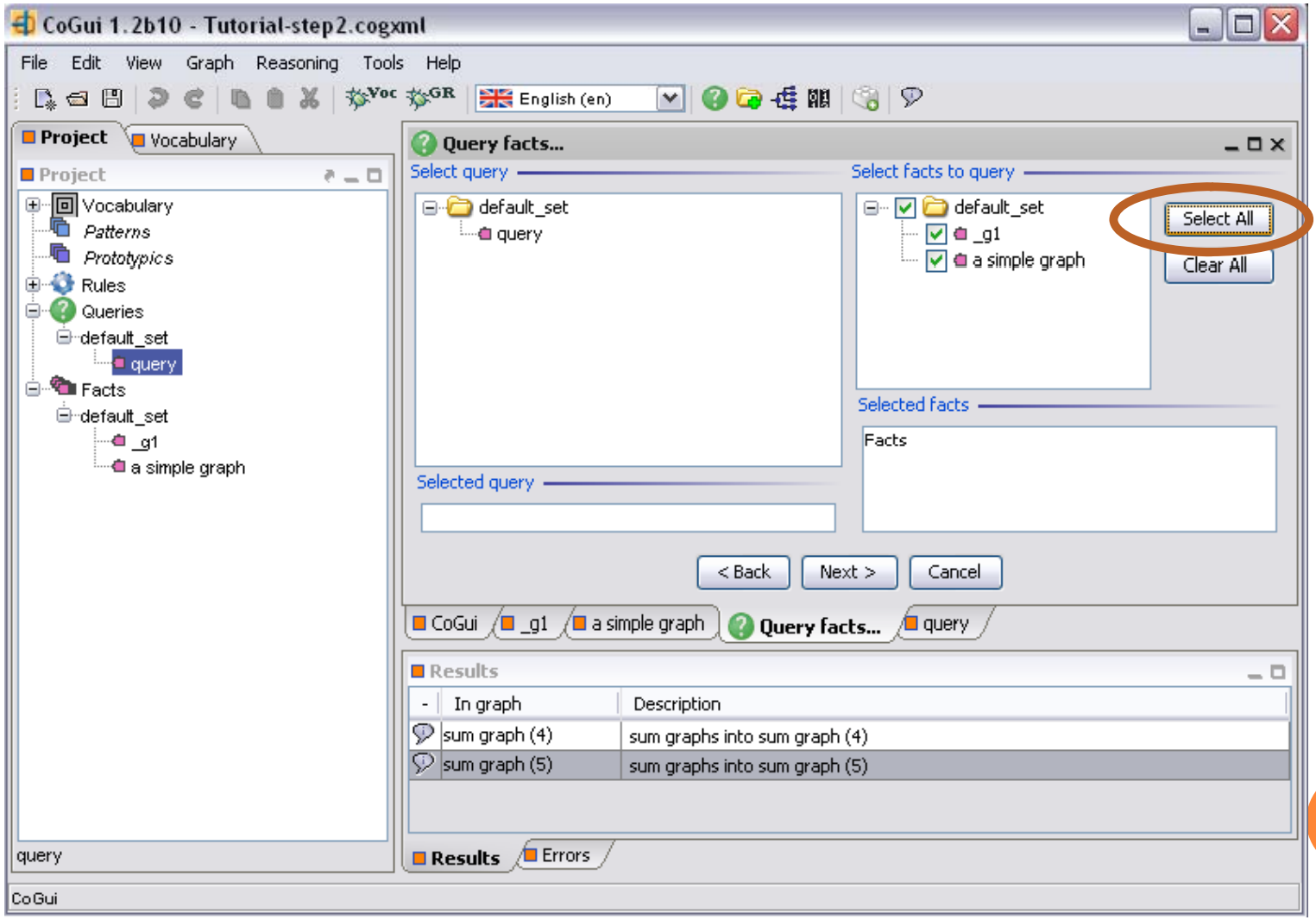
After writing the query select the query facts window



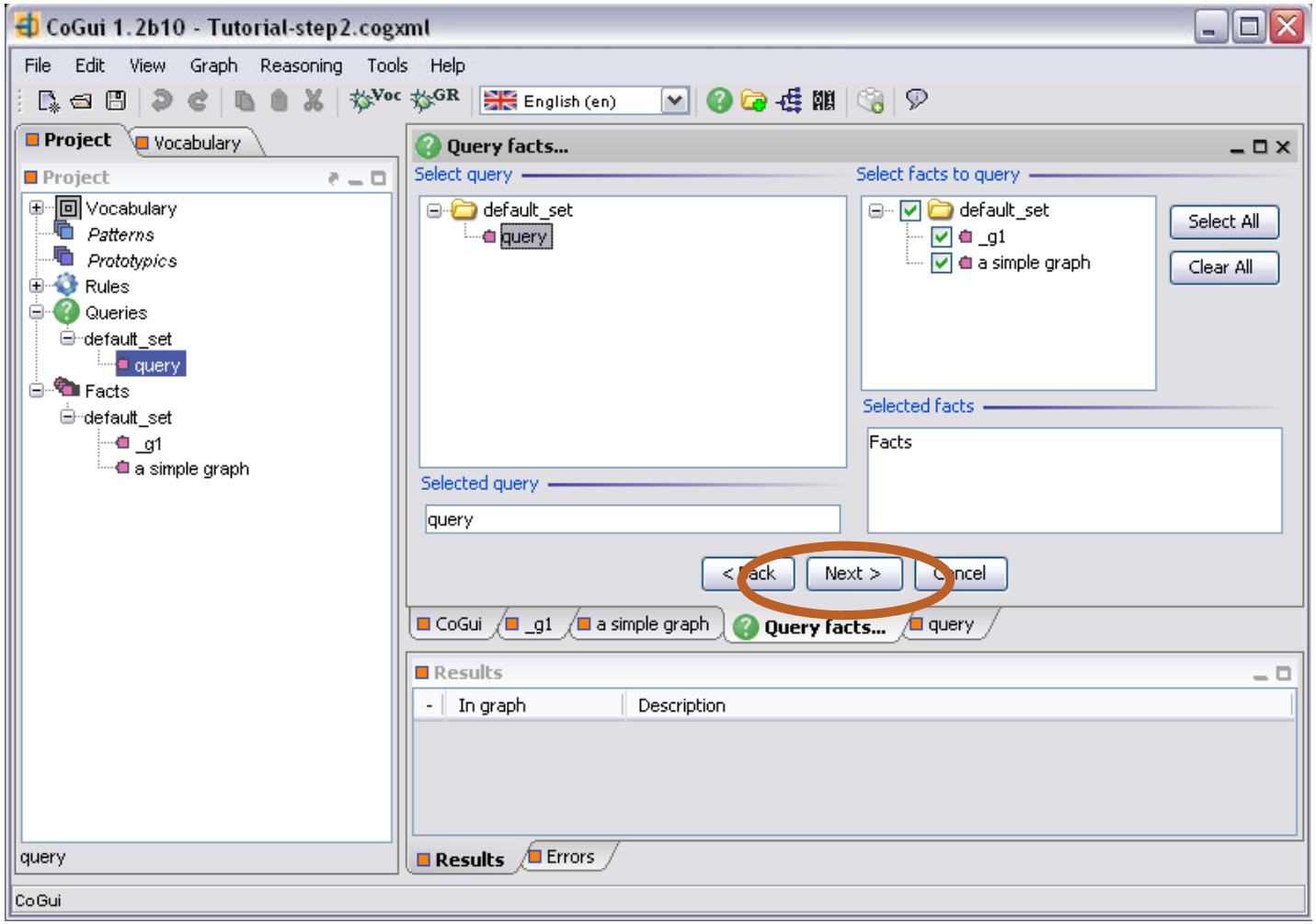
SELECT THE QUERY YOU WANT TO ASK



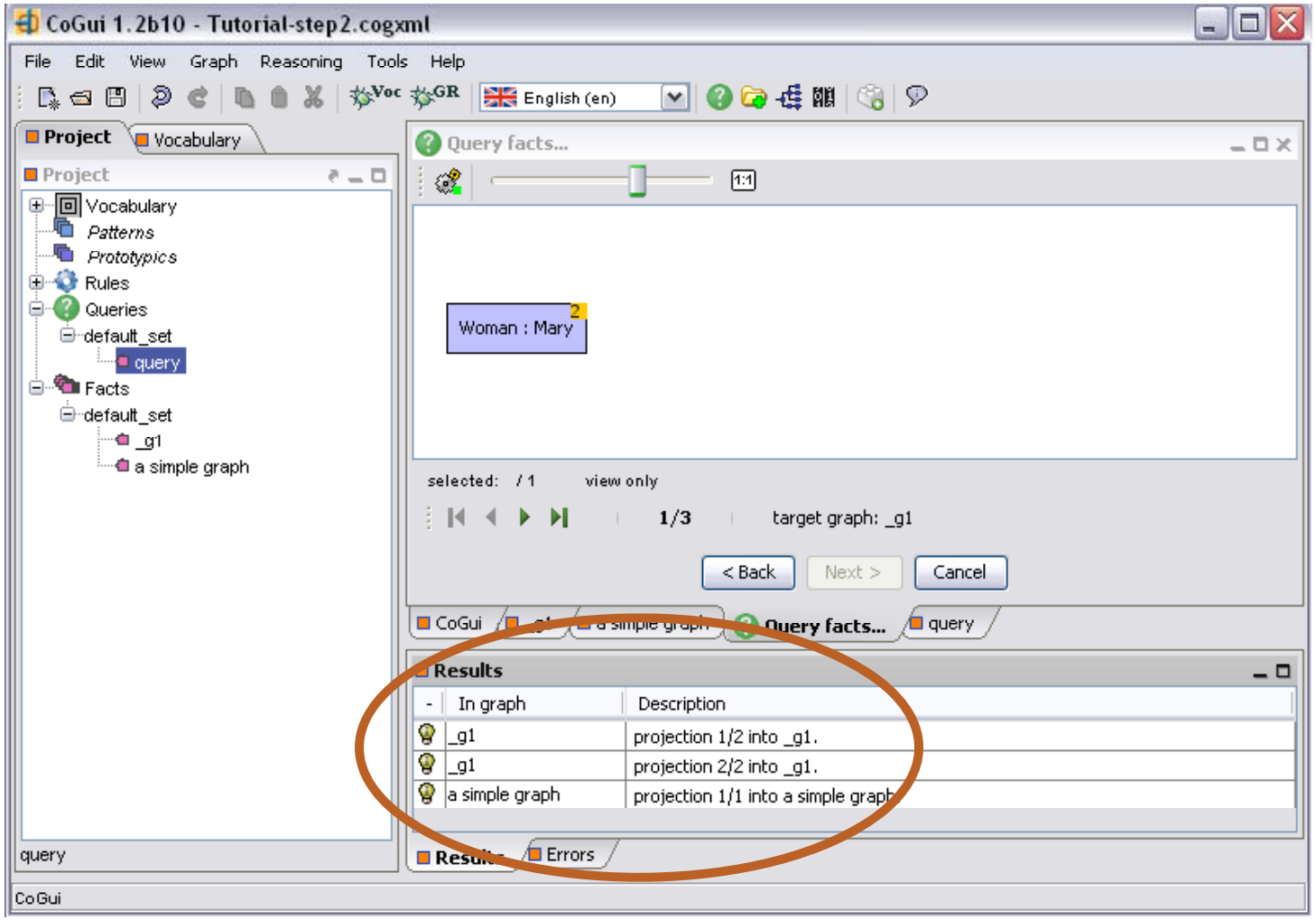
SELECT THE FACTS THAT YOU WANT TO USE TO ANSWER THE QUERY



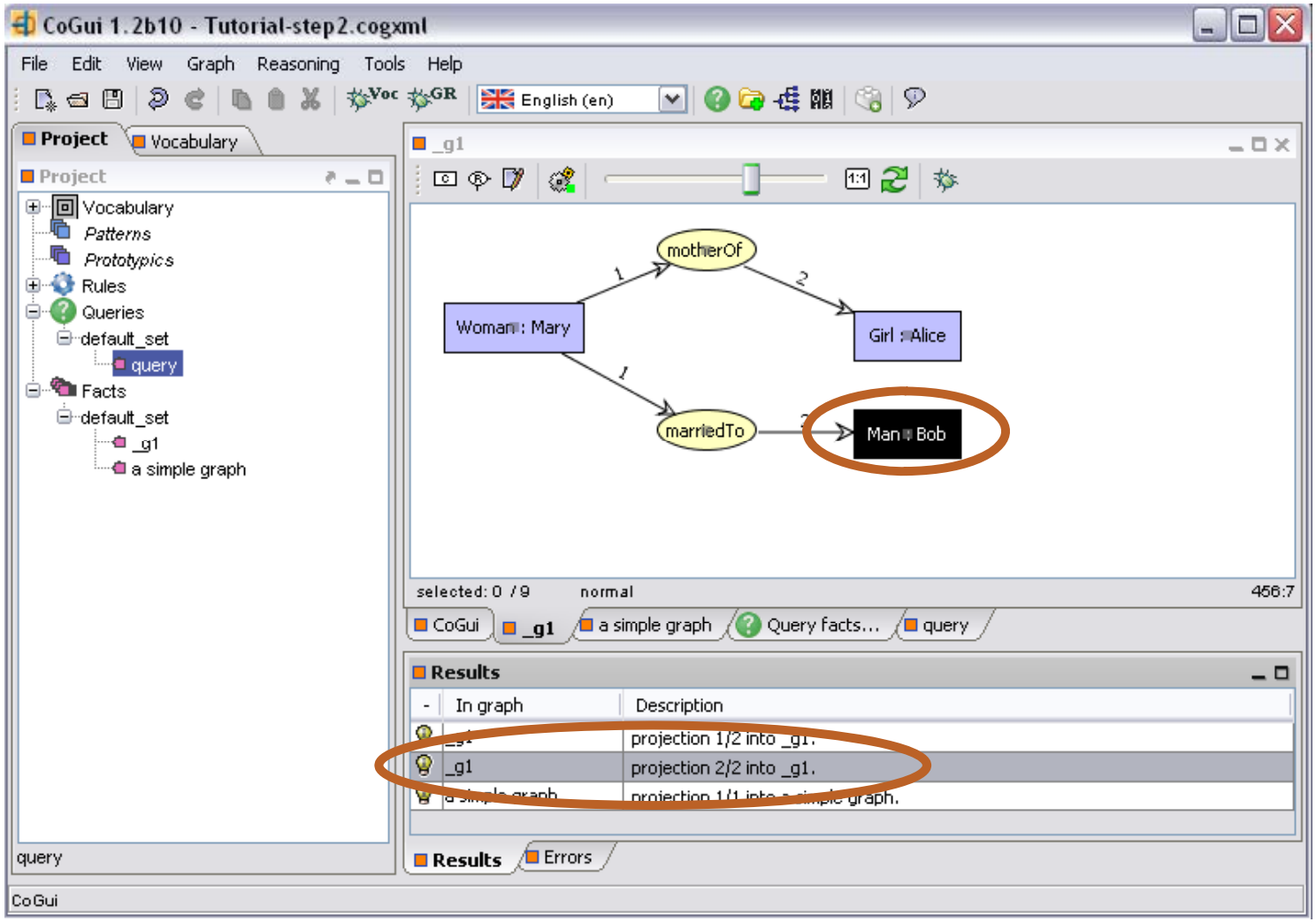
Click next to find the homomorphisms of the query in the selected facts



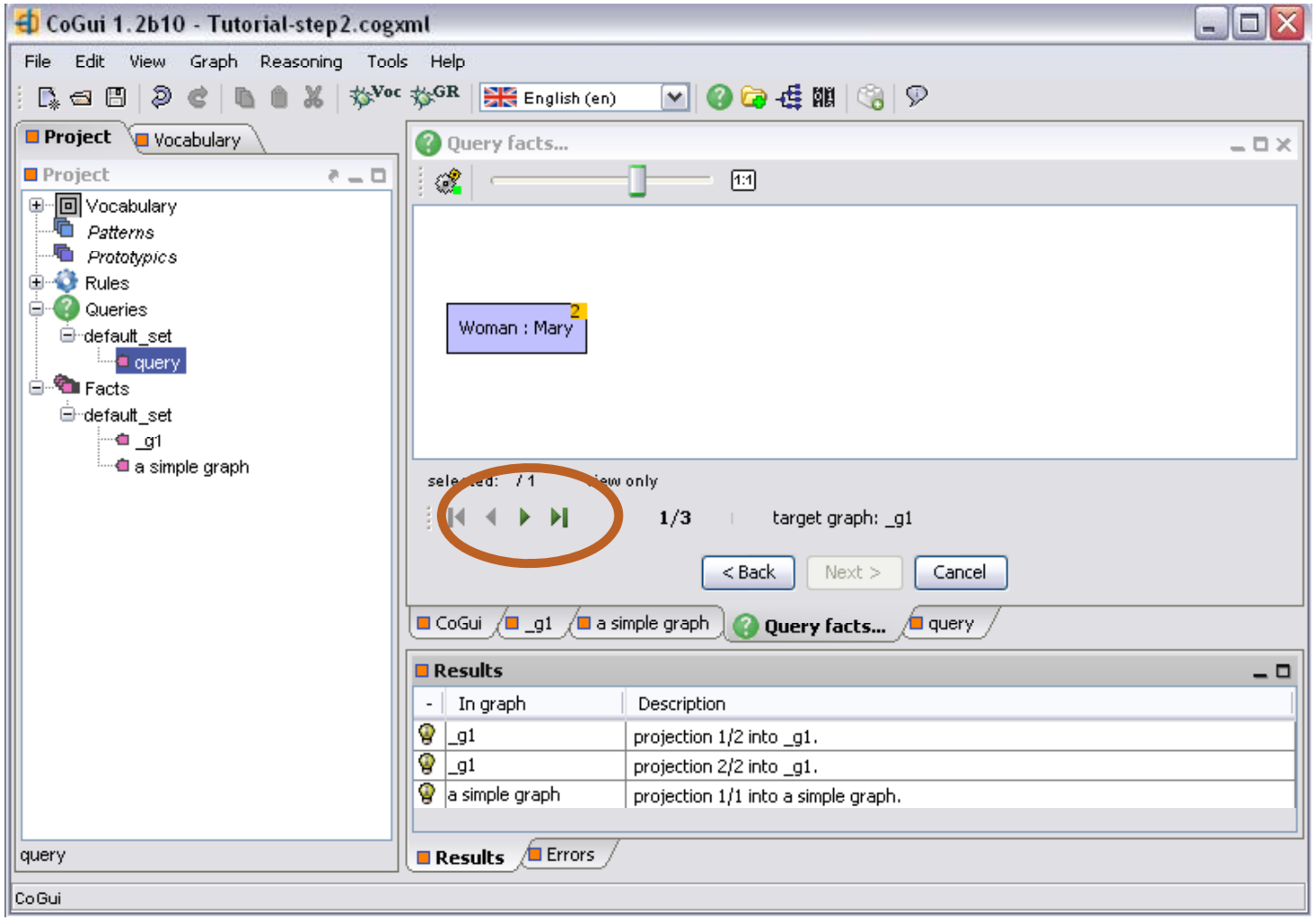
In the results window you can see the homomorphisms (projections) of the query in the fact graphs



SELECT ONE RESULT TO VIEW THE PROJECTION



If you only interested to see the image of the query use the visual navigator



THE VISUAL NAVIGATOR ONLY ALLOWS YOU TO SEE THE IMAGES OF THE PROJECTION