

## **World understanding and modeling**

Leonard Wallezký  
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# How do we model?

We are using different tools and approaches to model reality



Decision Model & Notation™

# But....

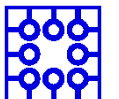
Do we really understand the models?

Are the models readable for others?

What if we need to communicate with people from other domains?

And what if we need to achieve understanding across domains?

How we can model in multidisciplinary way?



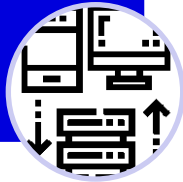
# Problem

What if we need to model Smart Street?

But from what perspective?

- networks
- sensors
- controllers

IT devices



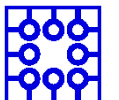
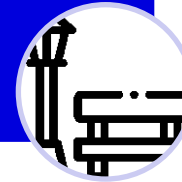
- water
- electricity
- facilities

Infrastructure



- street light
- benches
- bus stops

Equipment



# Solution is to go back to our roots and ask

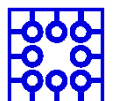
What are we modeling?

The answer is – objects from the real world

Where are we modeling?

The answer is - in our mind!

How does any person build own mind model?

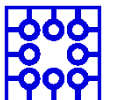


# How do we model reality in our heads?

We identify...

Object -s

...we find interesting

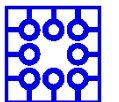


Then, we find...

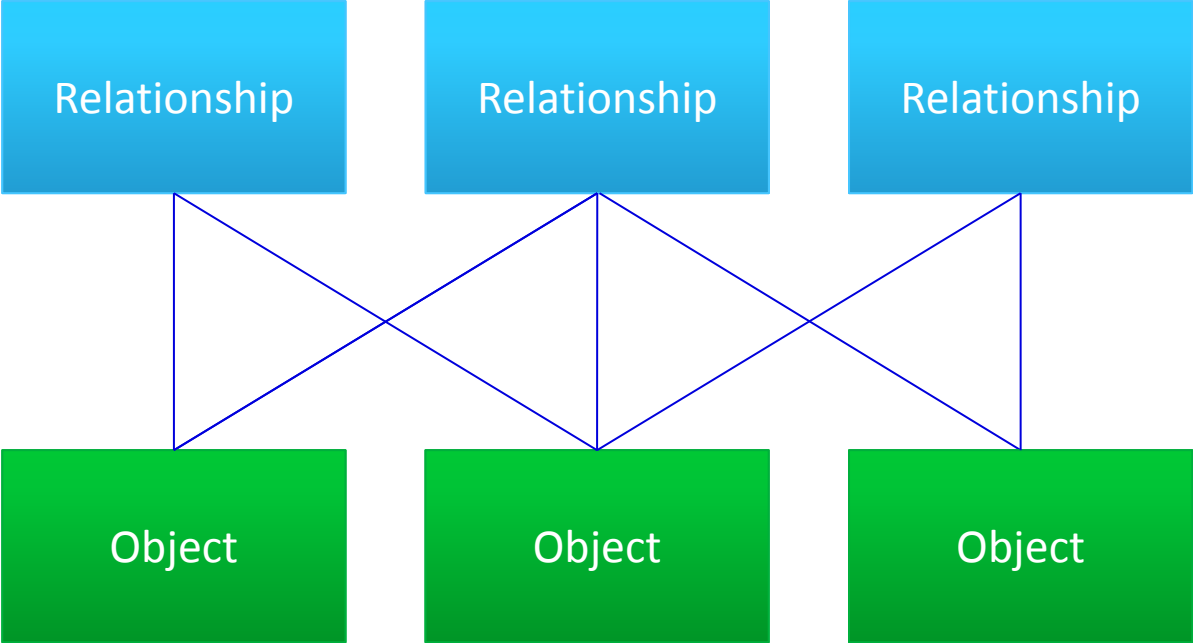
Relationship -s

...between our...

Object -s



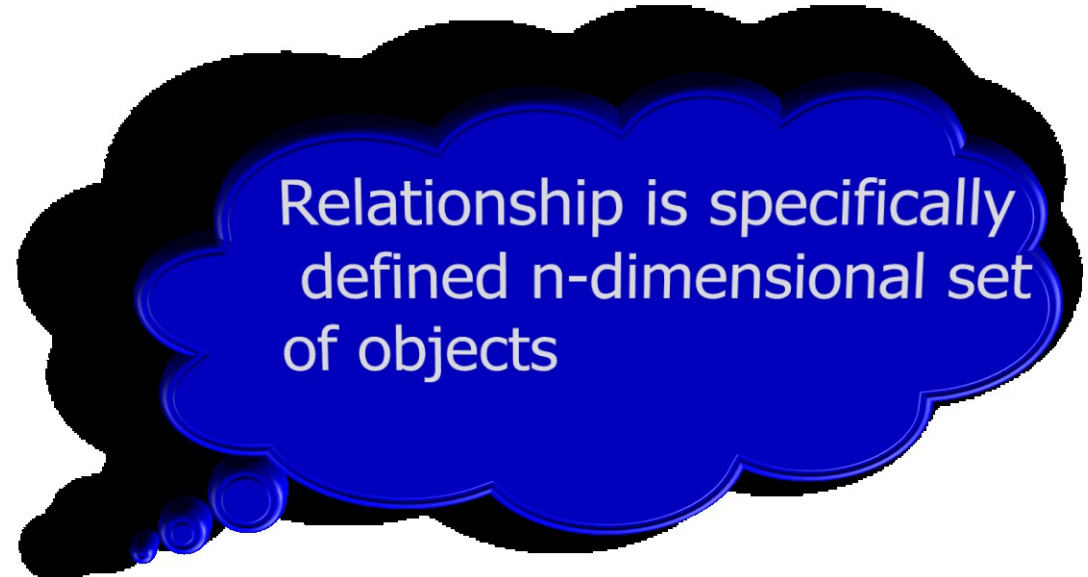
Each **relationship** can connect multiple objects...



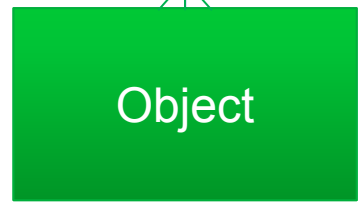
...and each object can be present in multiple connections.



Each relationship  $c$



$p_i$



...and each object can be present in multiple connections.



Which objects do we find interesting for

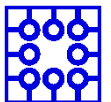


Category

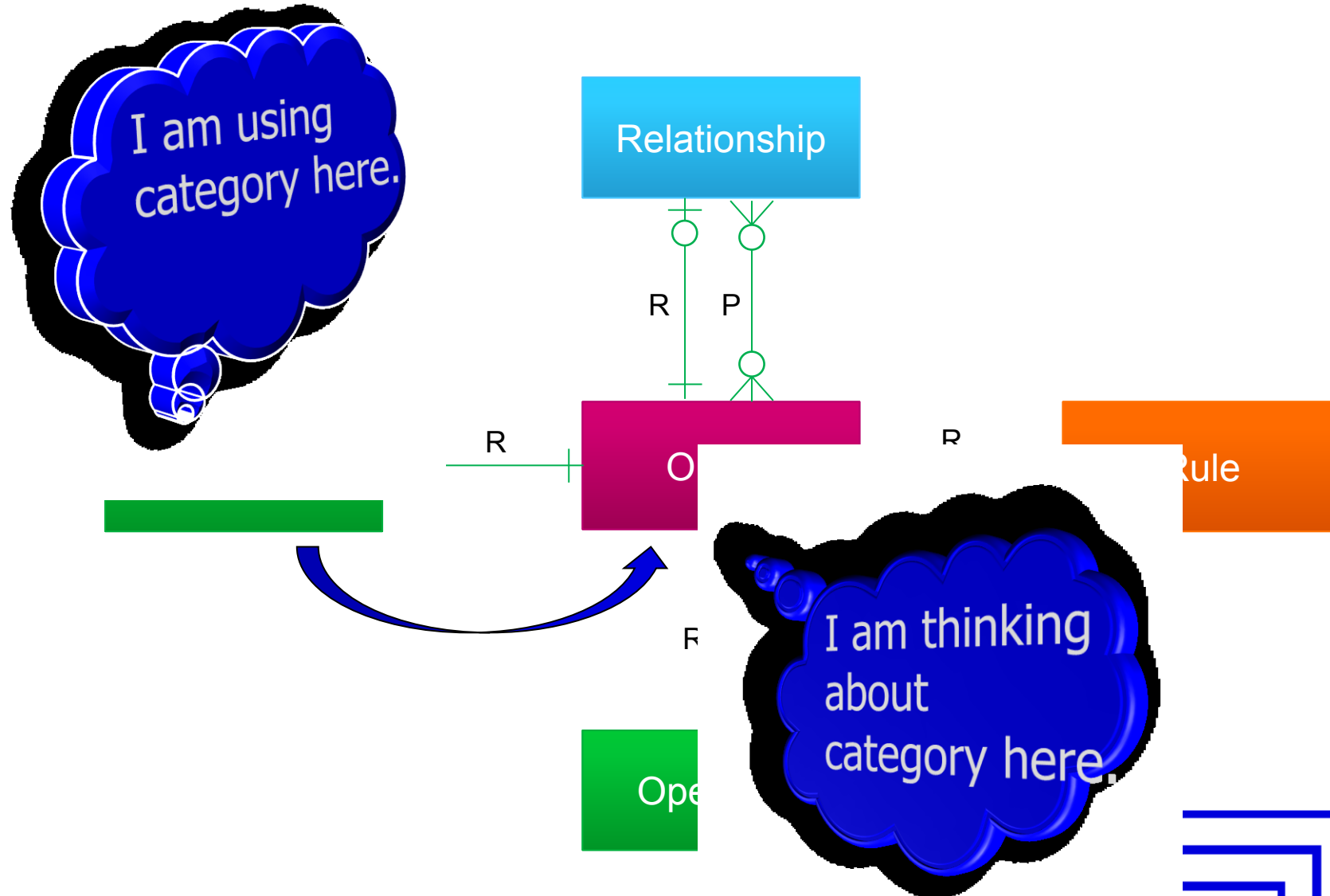
Relationship



Operation



# MENTION – USE duality



Diam

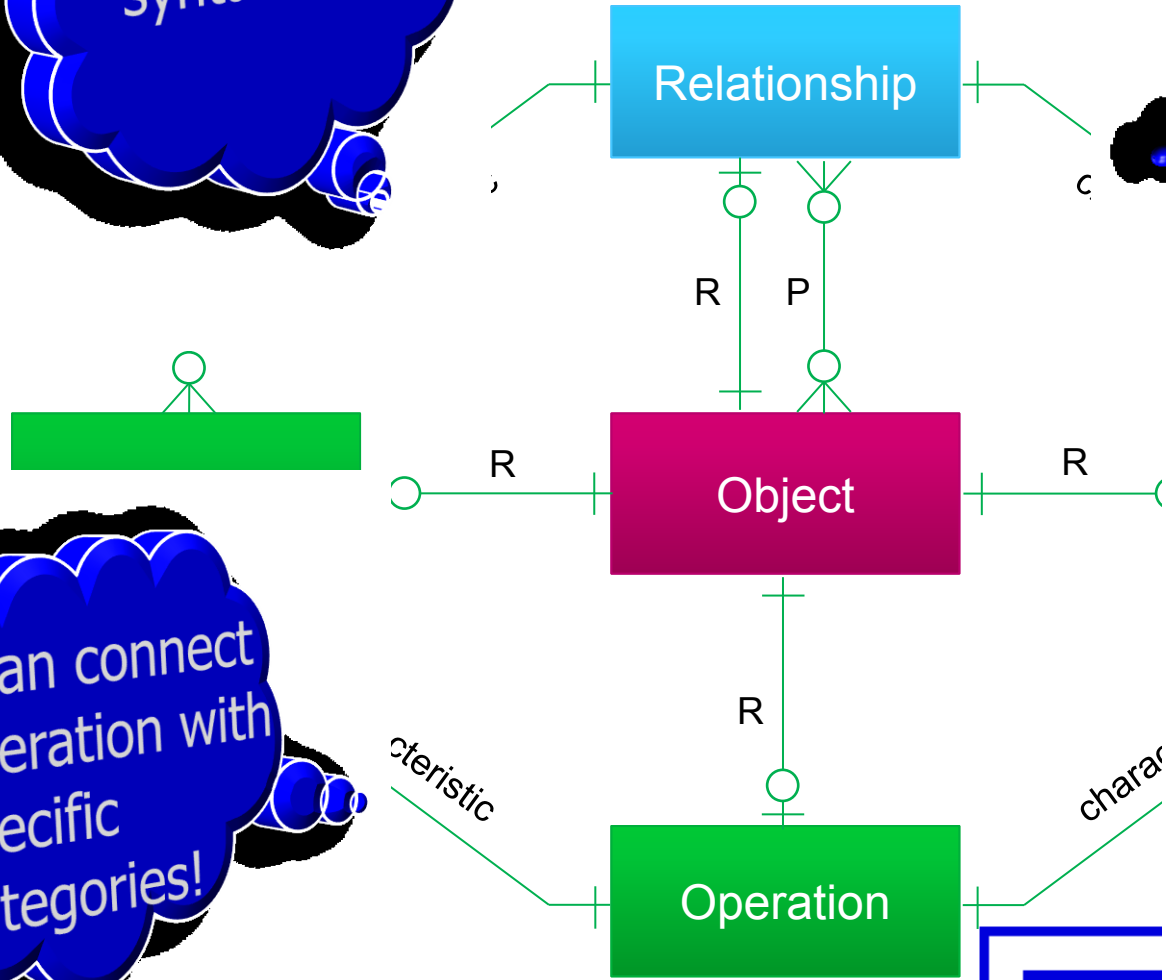
ntion Focus

I am in syntactic part

I can connect relationship with dynamic rule!

I can connect operation with specific categories!

I am in dynamic part

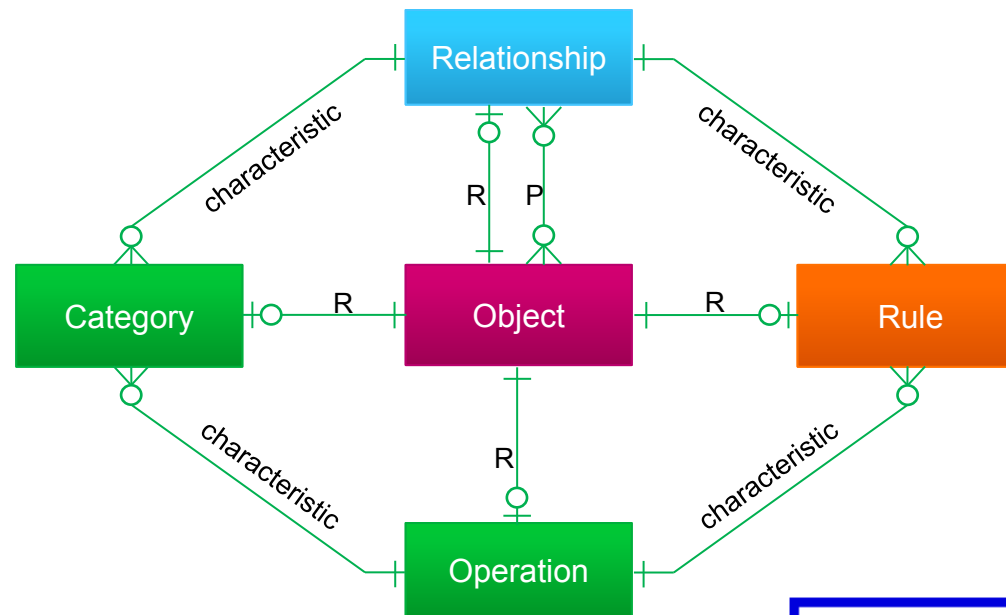


# Diamond of Attention Focussing

Objects and relationships among them

Mention-use duality

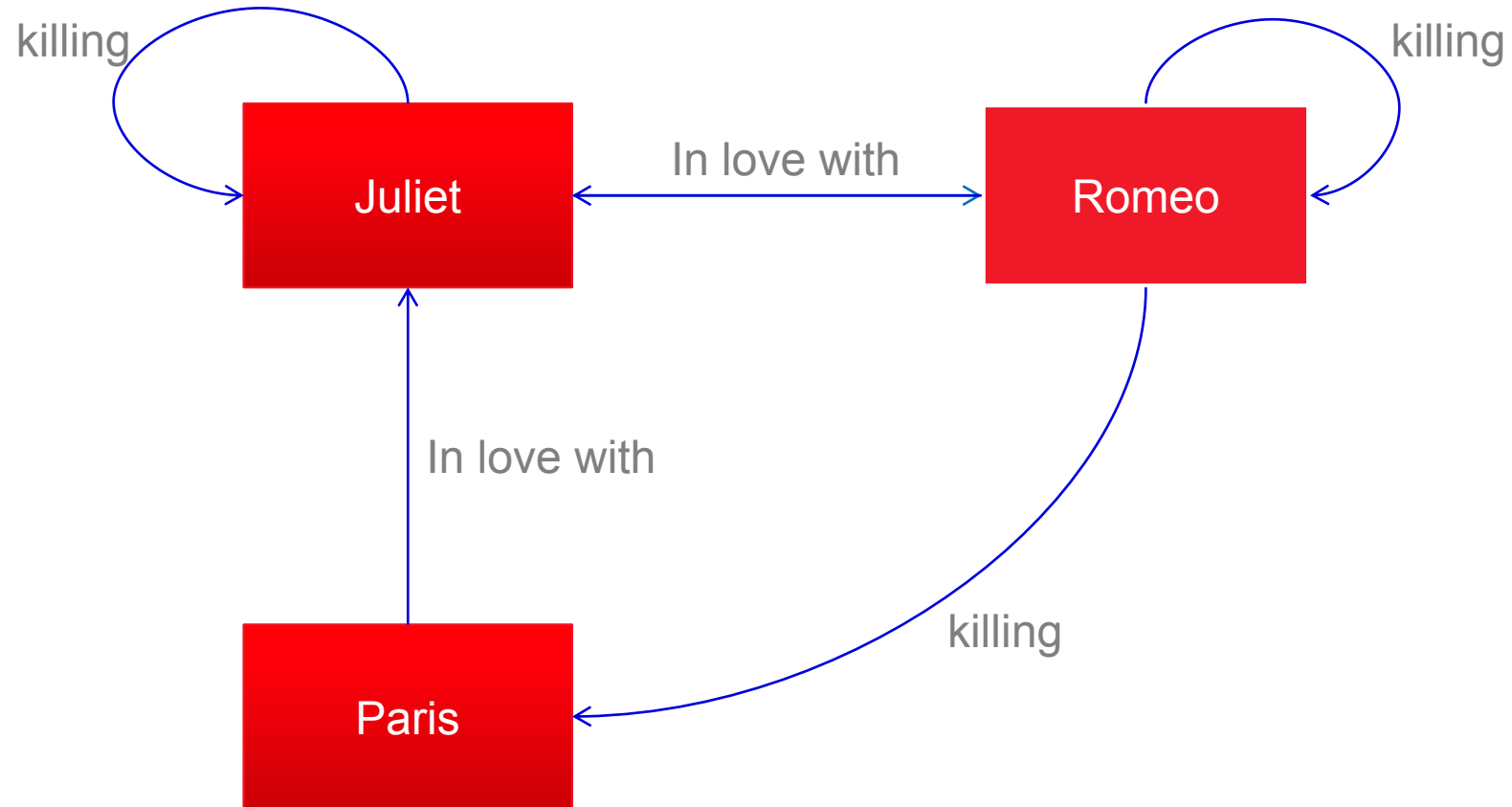
Modelling a modelling tool



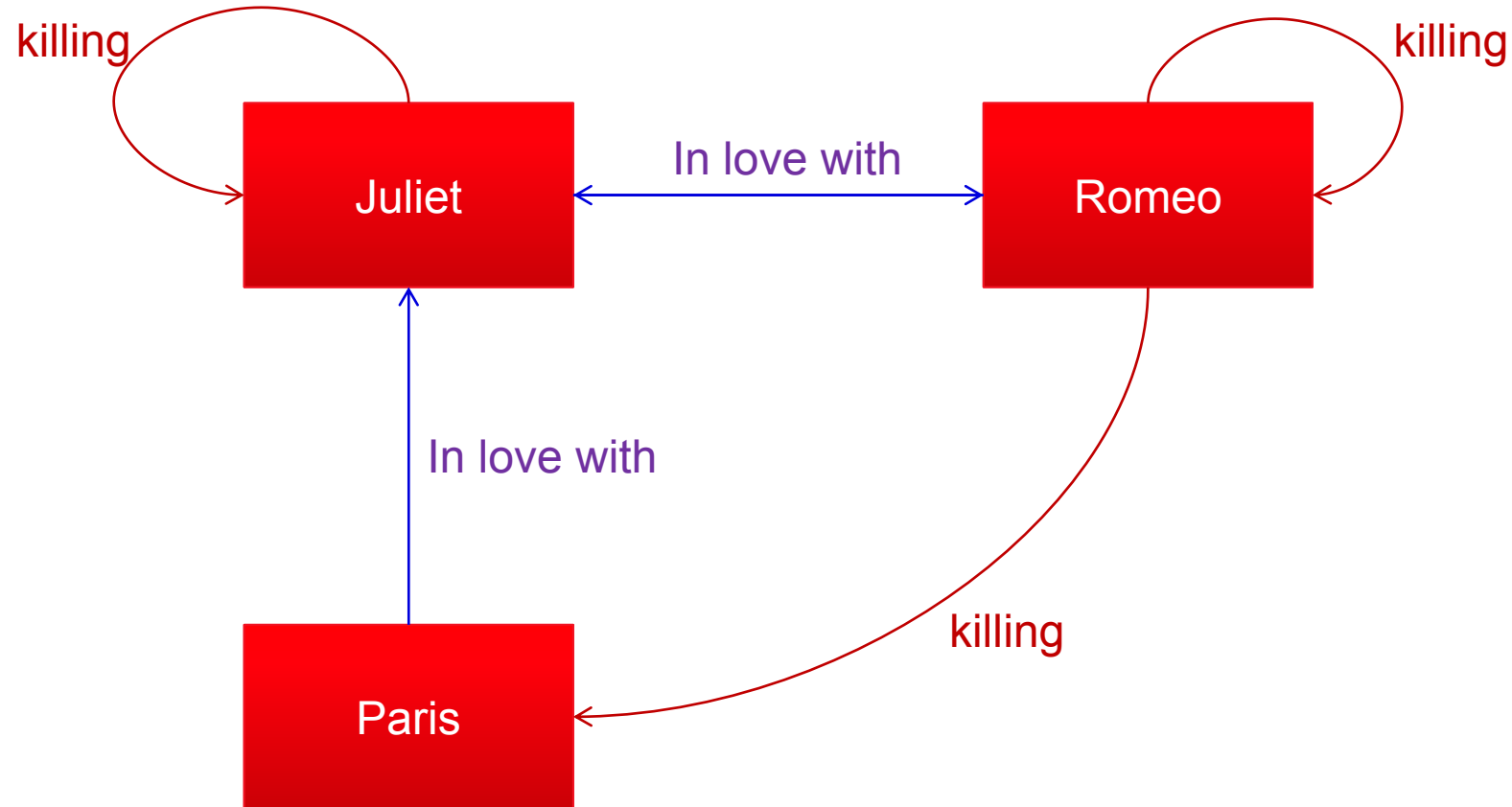
# Road (street) - Objects and relationships

| Name           | Relationship | Name   |
|----------------|--------------|--------|
| Road           | Is on        | Street |
| Car            | Is on        | Road   |
| Bus            | Is on        | Road   |
| Bicycle        | Is on        | Road   |
| Pedestrian way | Is on        | Street |
| Driving lines  | Are dividing | Road   |
| Trees          | Are plant on | Road   |

# Example – world best known story

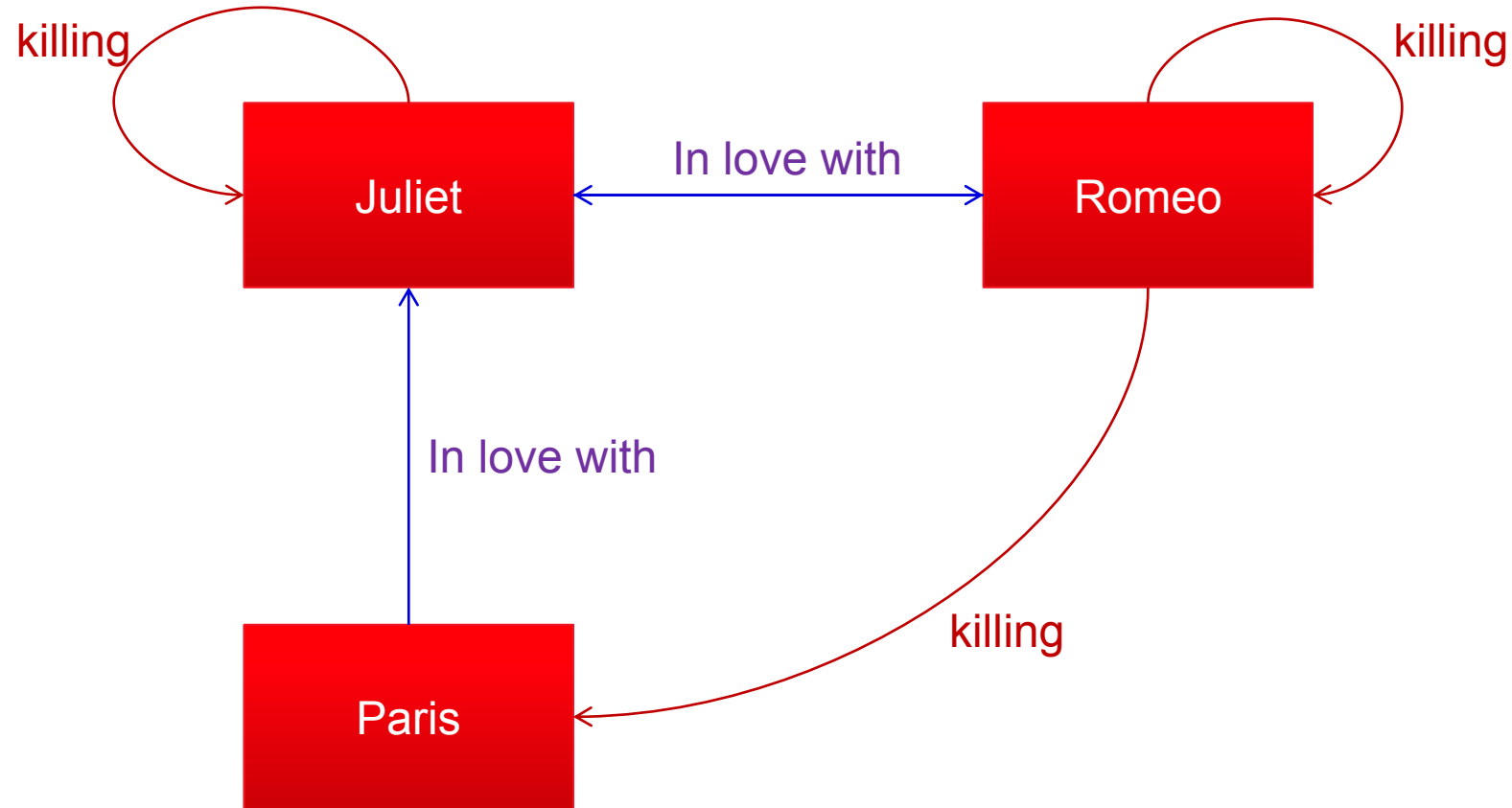


We can see that some connections are somehow similar – they belong to the same **category**:

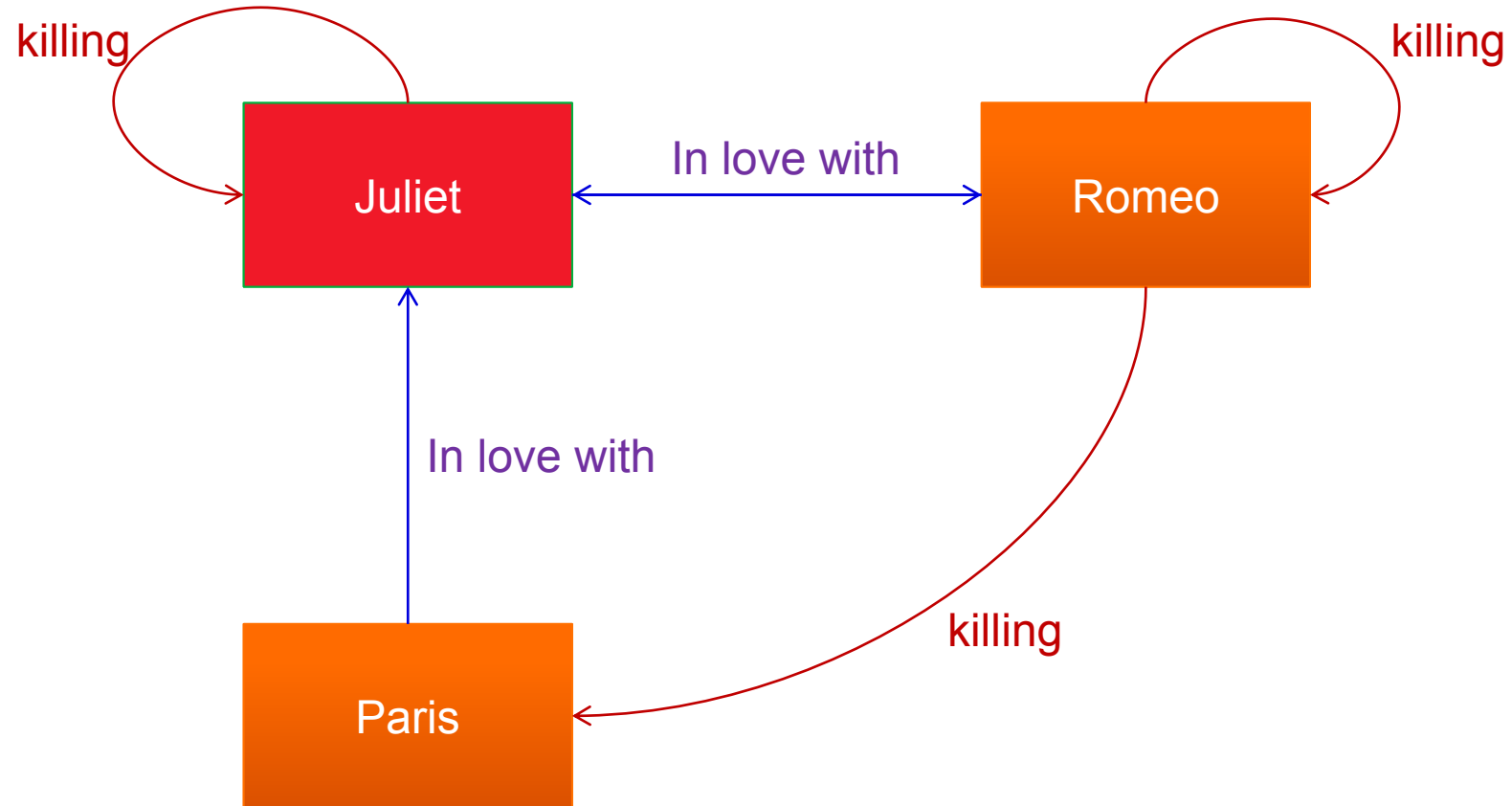




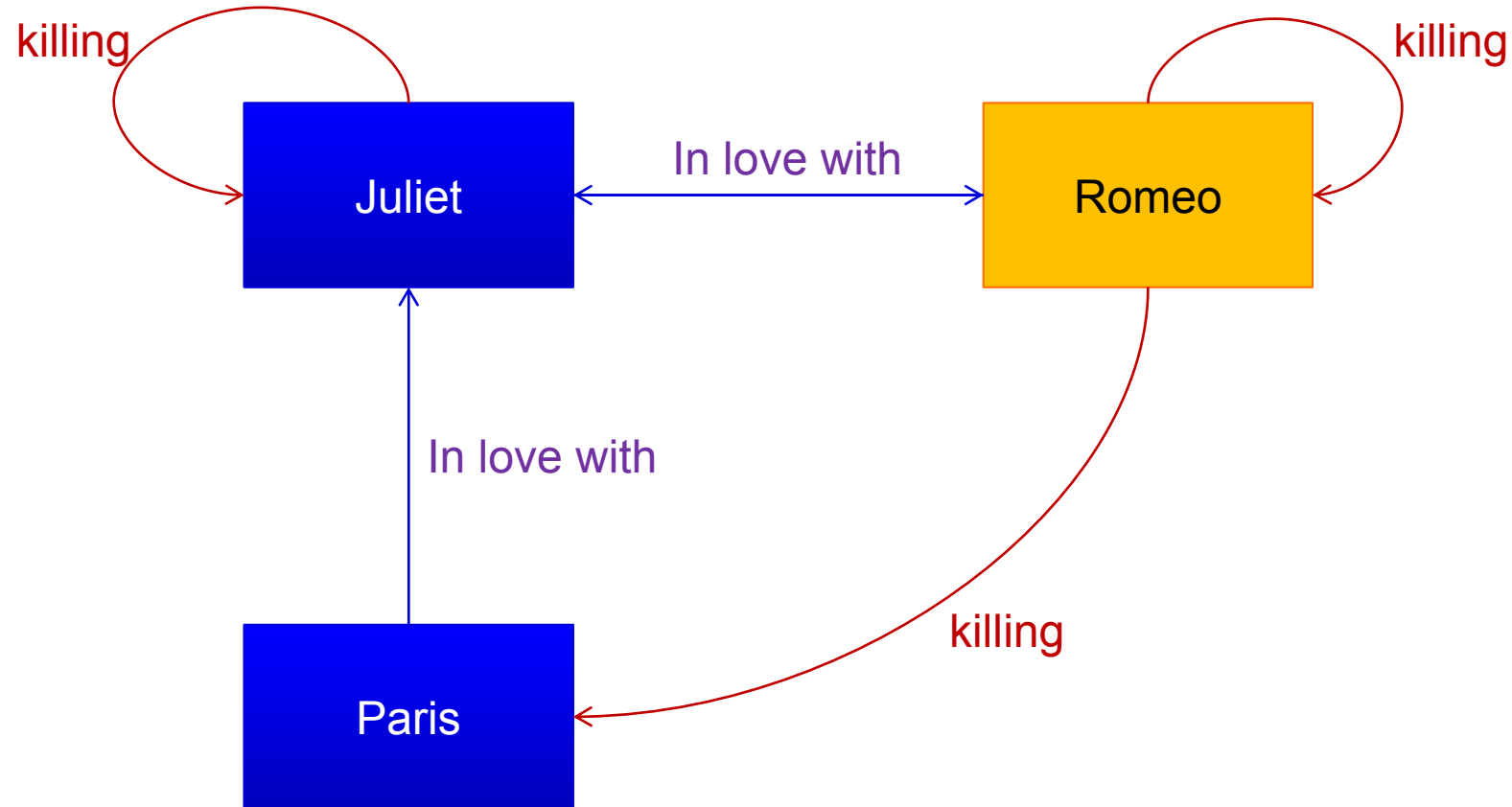
It's possible to classify everything we see in the diagram. But how to classify our objects?



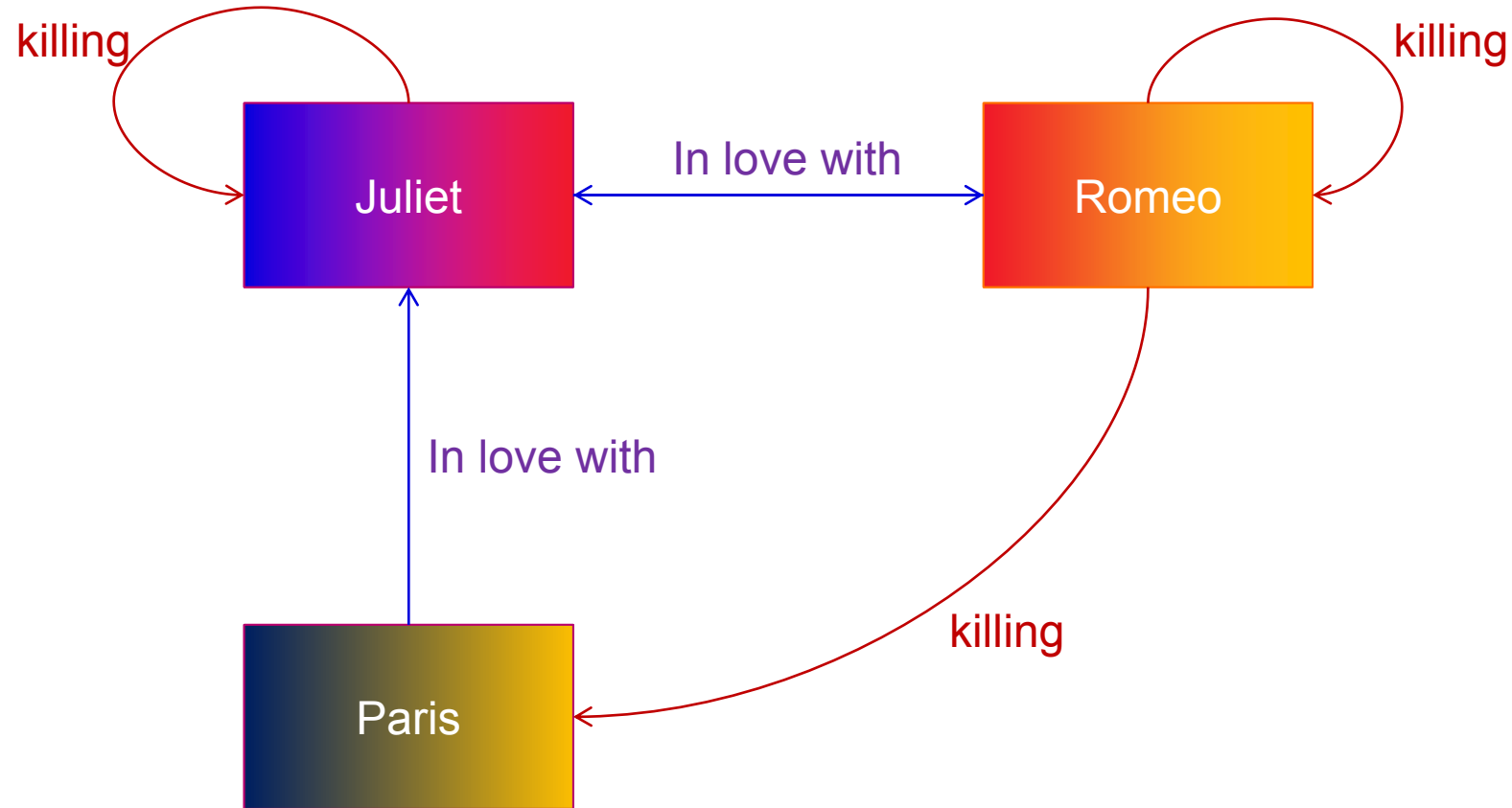
We could certainly divide the objects to **men** and **women**:



But won't it be more useful to show, which character belongs to the house of **Montague** and which one to the house of **Capulet**?



It probably depends on a context – a mental model we want to build.  
Sometimes, both categorizations may be useful:



# Classifications are blurred

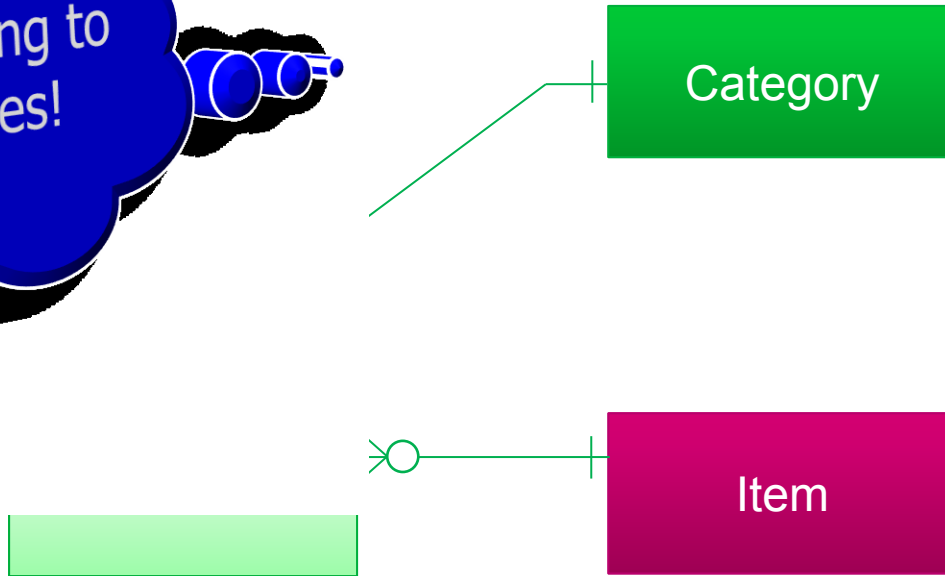
Good or bad?



# Certainty

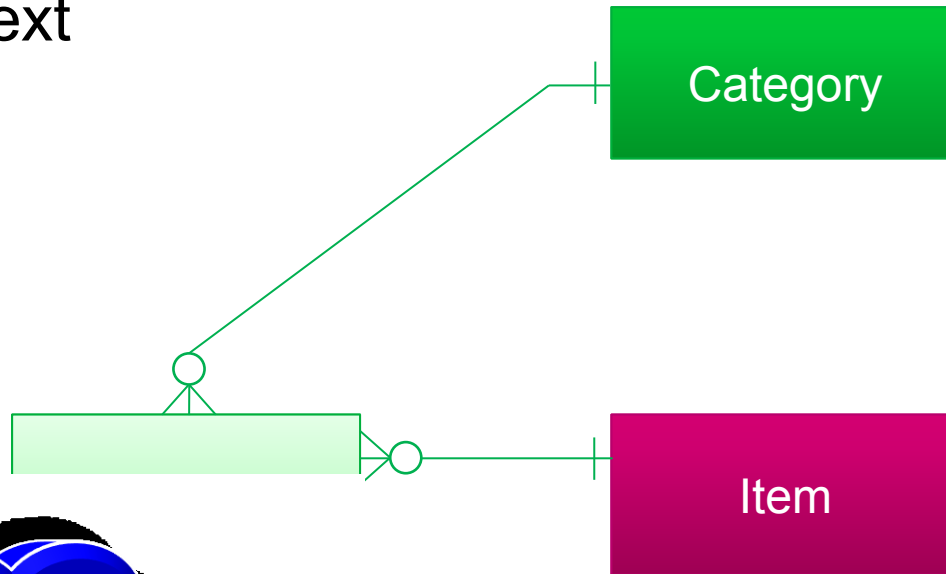
Item can belong to more categories!

(= objects as such, not their constructs) belongs to a category with a given certainty



# Attention

The fact is manifested with a certain attention in a given context

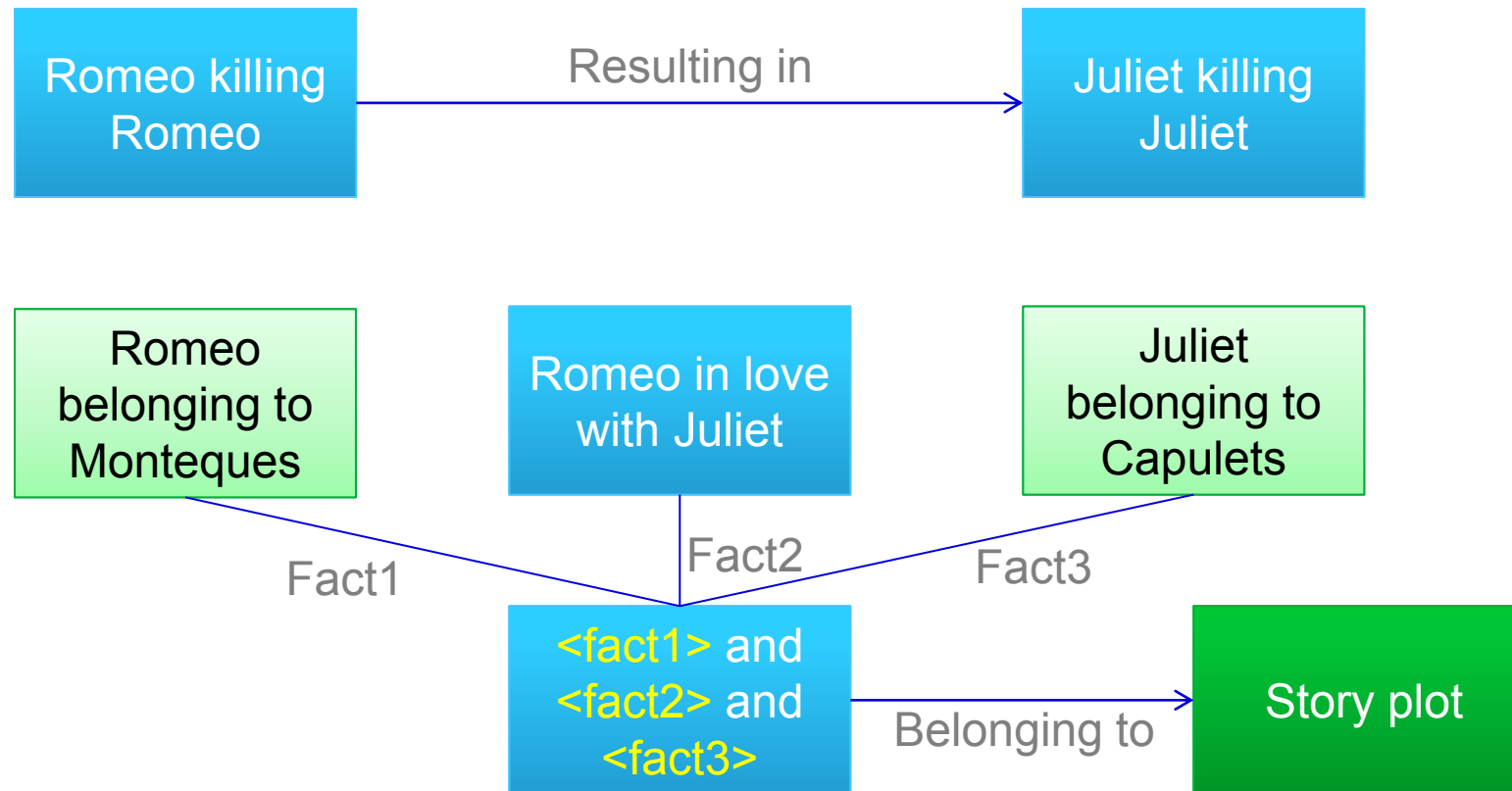


And here it is about particular manifestation of CI connection

And context gives a design to the manifestation.

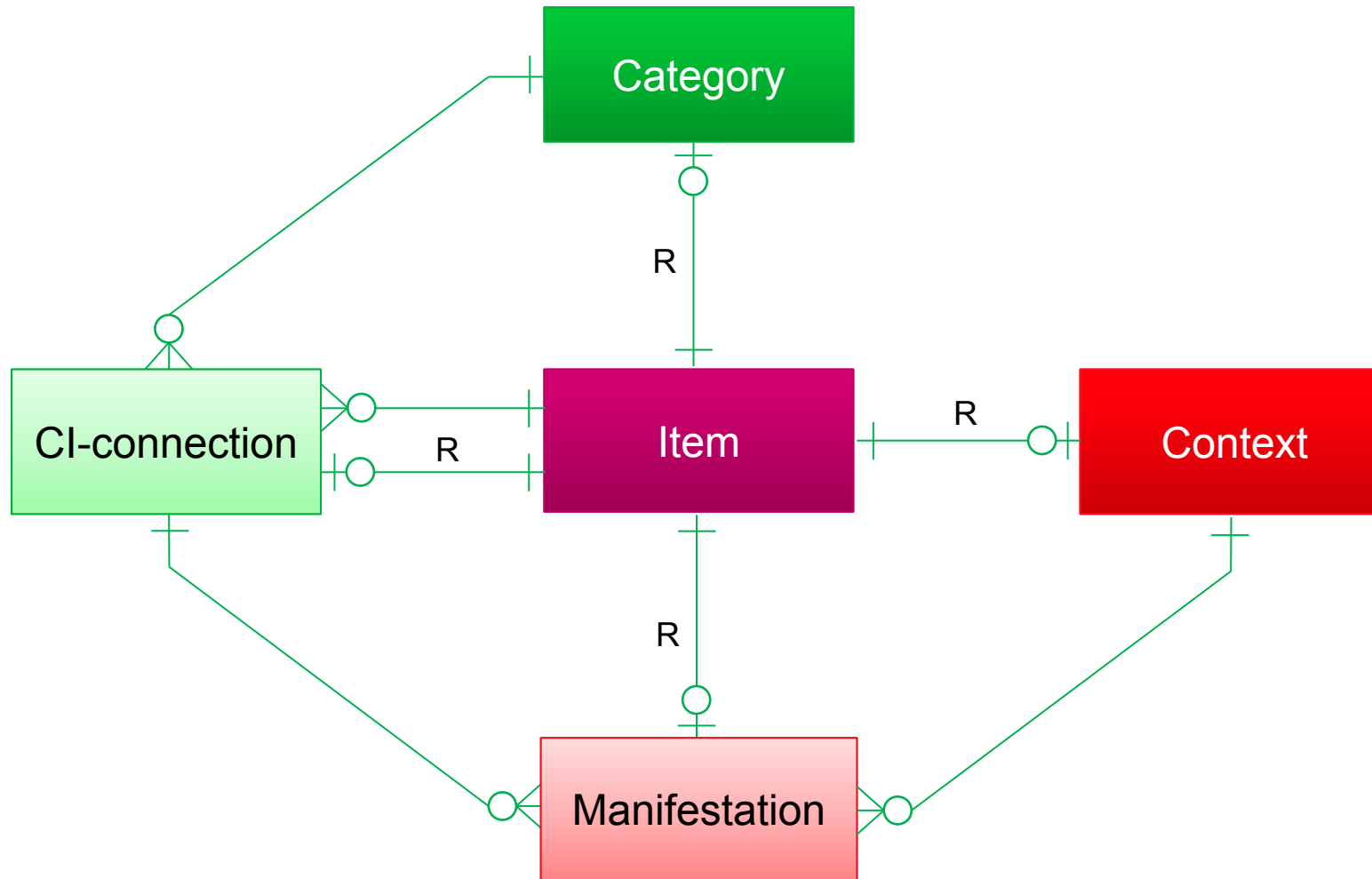
# R-edges

- In some cases, it might be also useful to mention non-trivial concepts – contexts, categories, classifications or manifestations





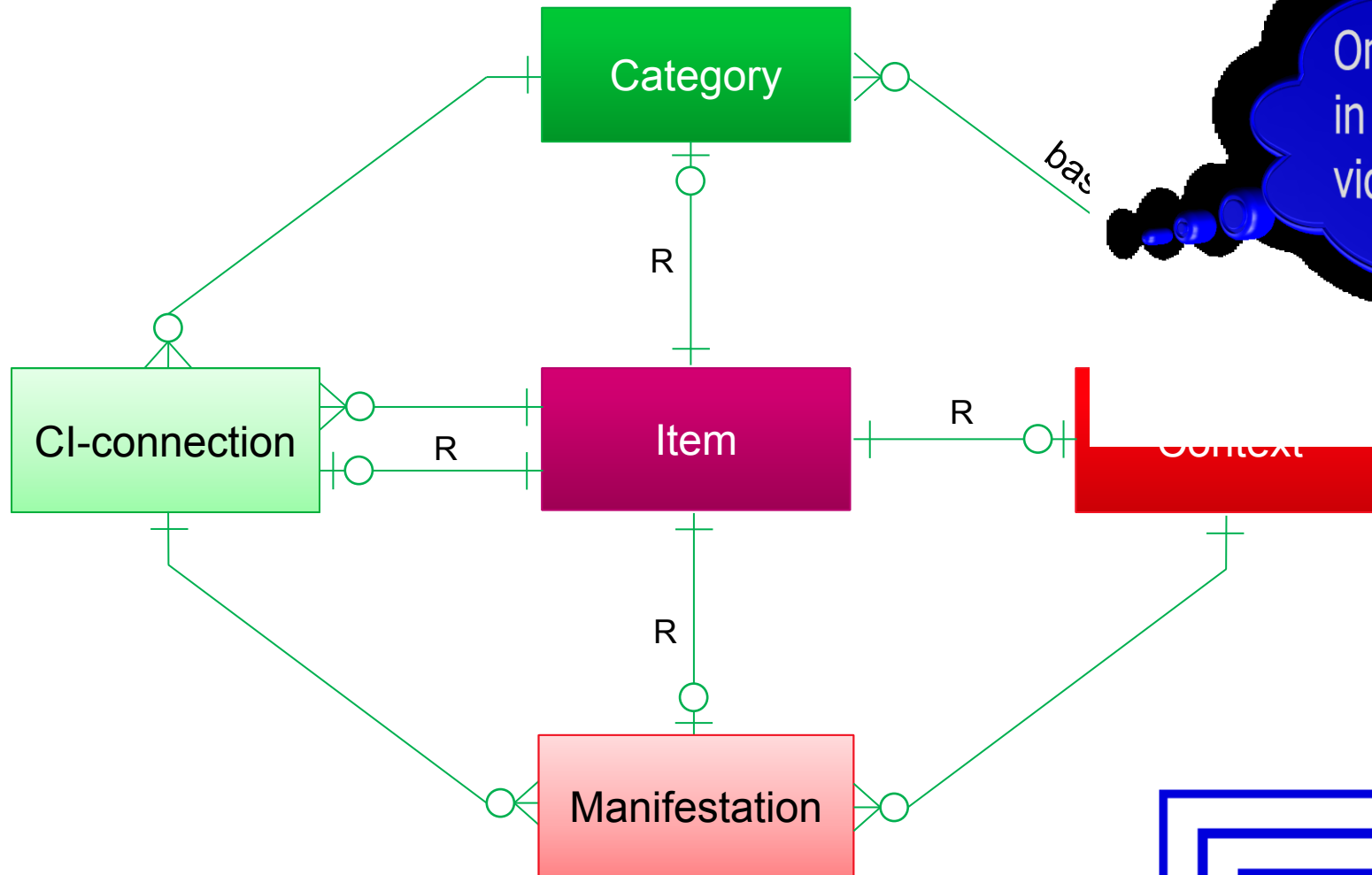
# R-edges



# Context base

Context serves as a model. The base edge  
defines  
to

One category can exist  
in more contexts and  
vice versa.



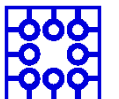
# Why we need it?

In the complex service environment (like Smart City) only one perspective is not enough

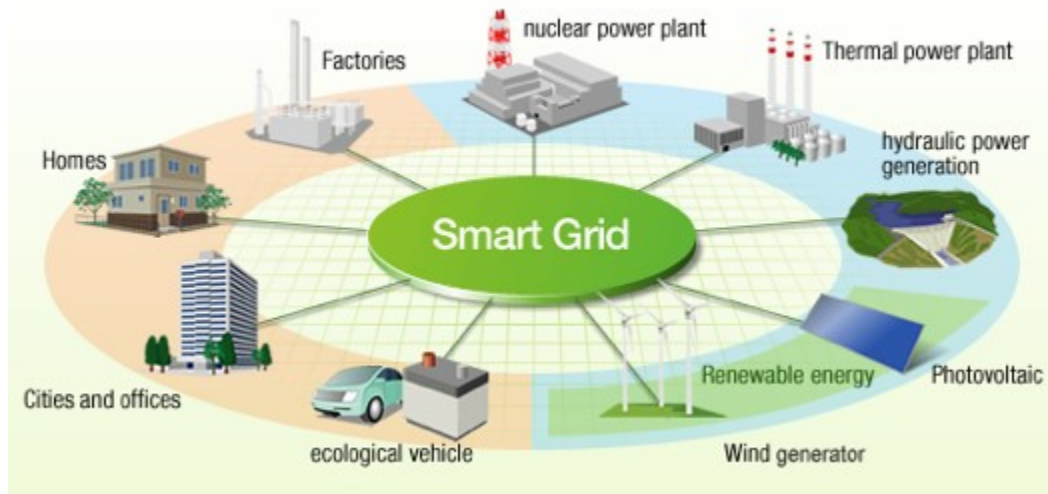
Already in a very simple applications we need to work with different manifestation of the same item

If we add the relation to other Services, environments (e.q. contexts) we get very complex model

To understand we need to have the possibility to analyze the manifestation of each item in all contexts



# Examples



# Conclusion

There is more than one context

Your perspective can be different from the others

Goal of the multidisciplinary team is not to move everyone to one context

Goal is to develop a way how to interconnect those contexts into valueable structure

# Sources

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