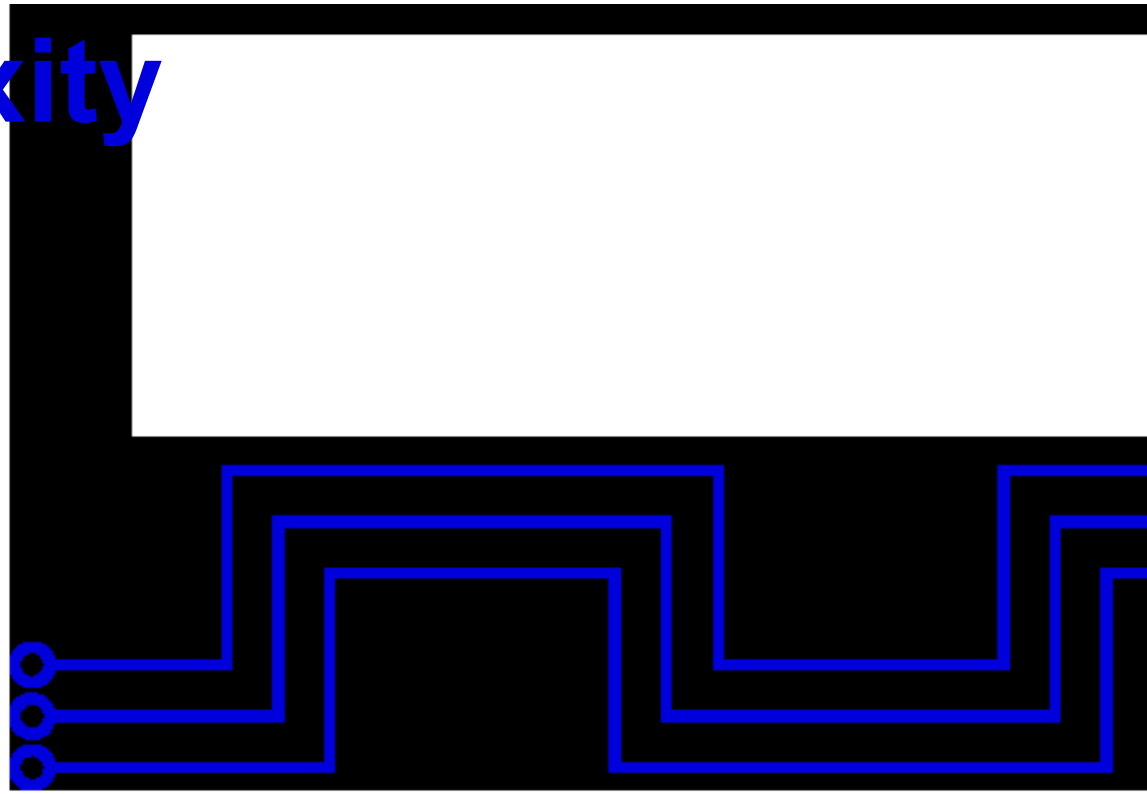
MUNI FI

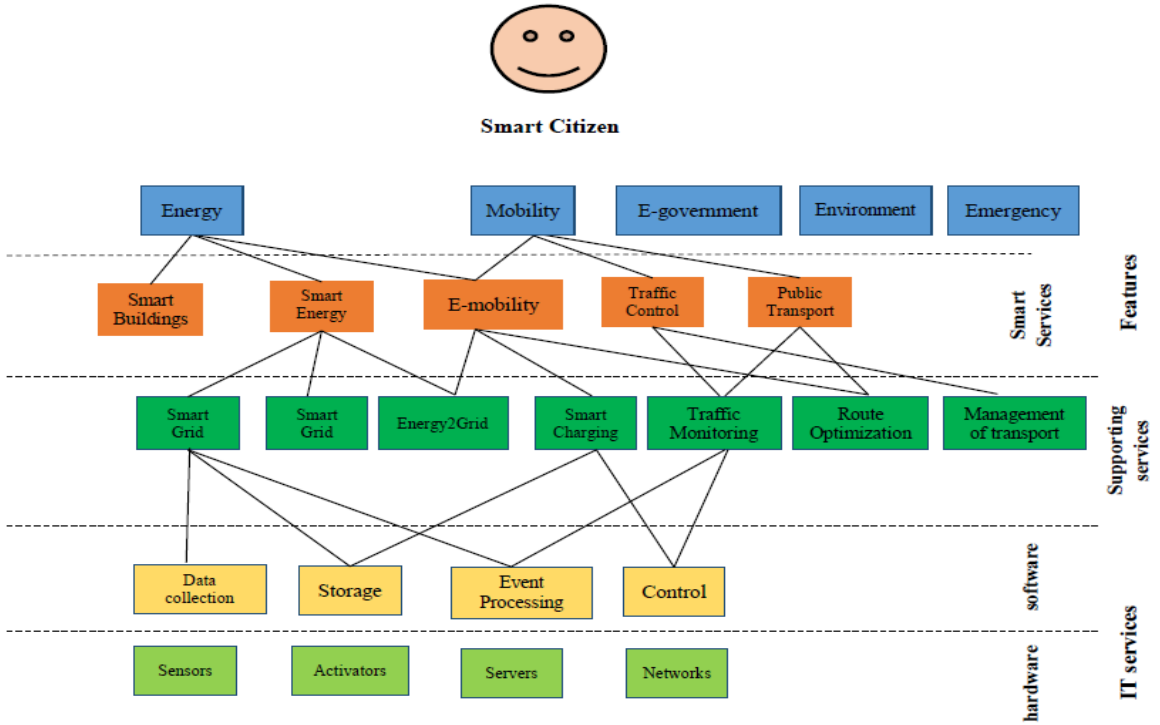
Laboratory of Service Systems

Smart City and Complexity

How to understand complexity of Services



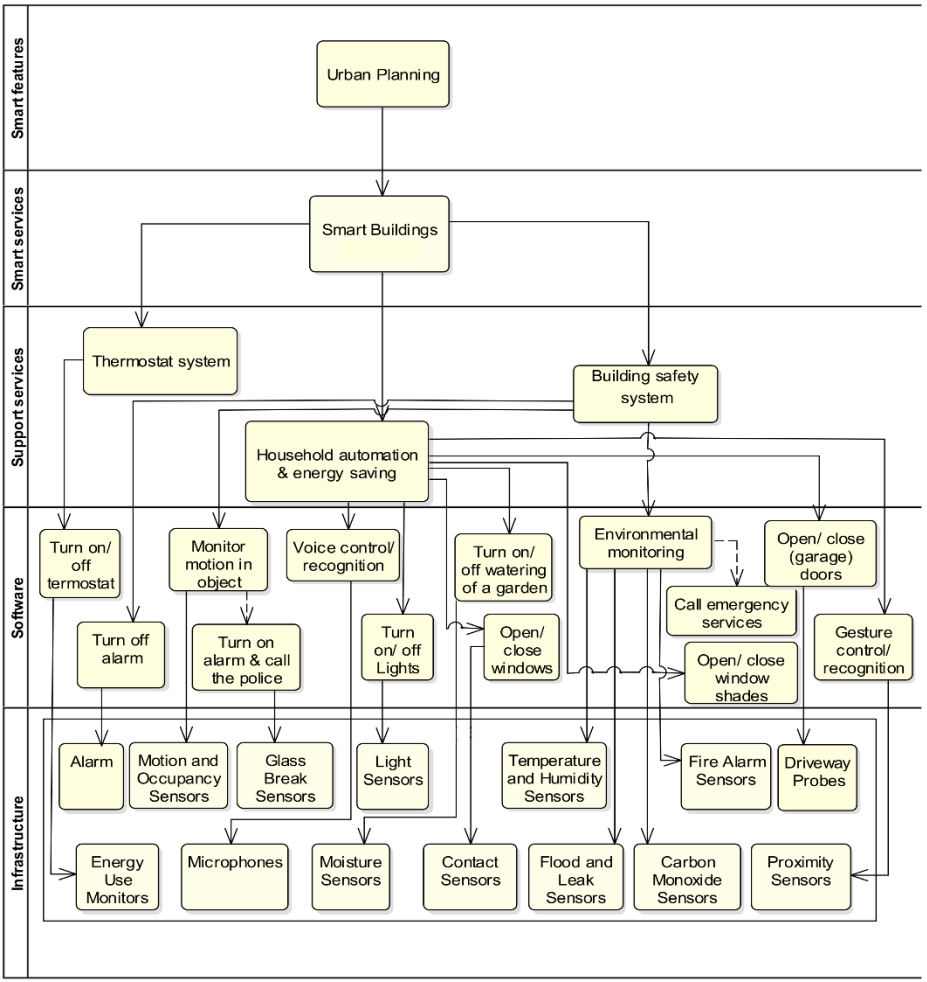
Layer model of Smart City



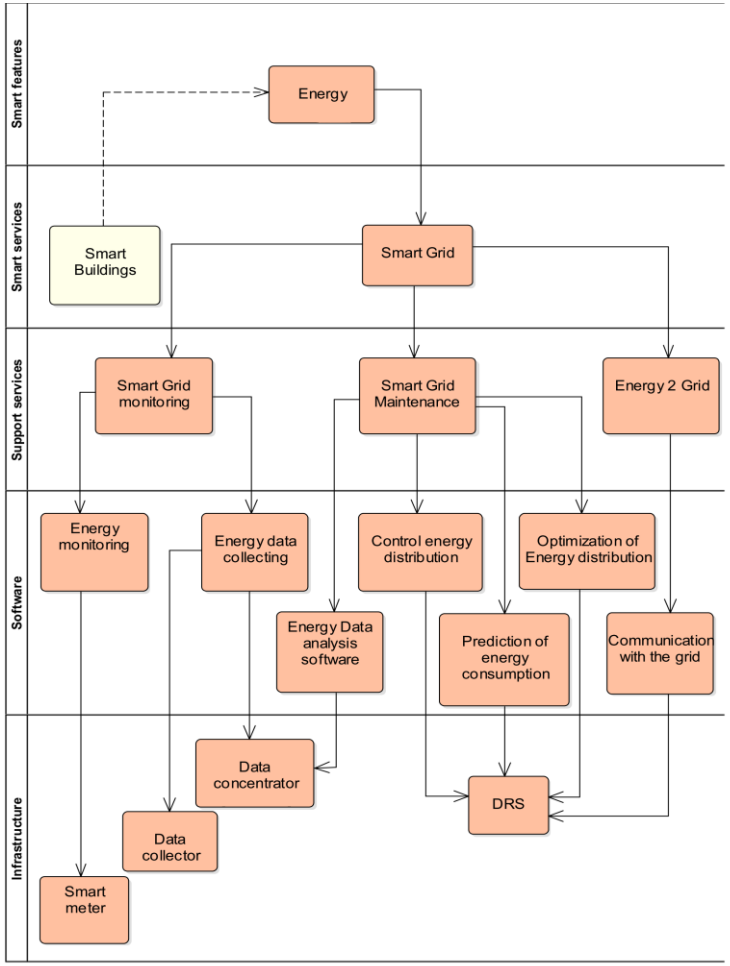
Walletzky L., Buhnova B., Carrubbo L. (2018) Value-Driven Conceptualization of Services in the Smart City: A Layered Approach. In: Barile S., Pellicano M., Polese F. (eds) Social Dynamics in a Systems Perspective. New Economic Windows. Springer, Cham

Laboratoř servisních systémů

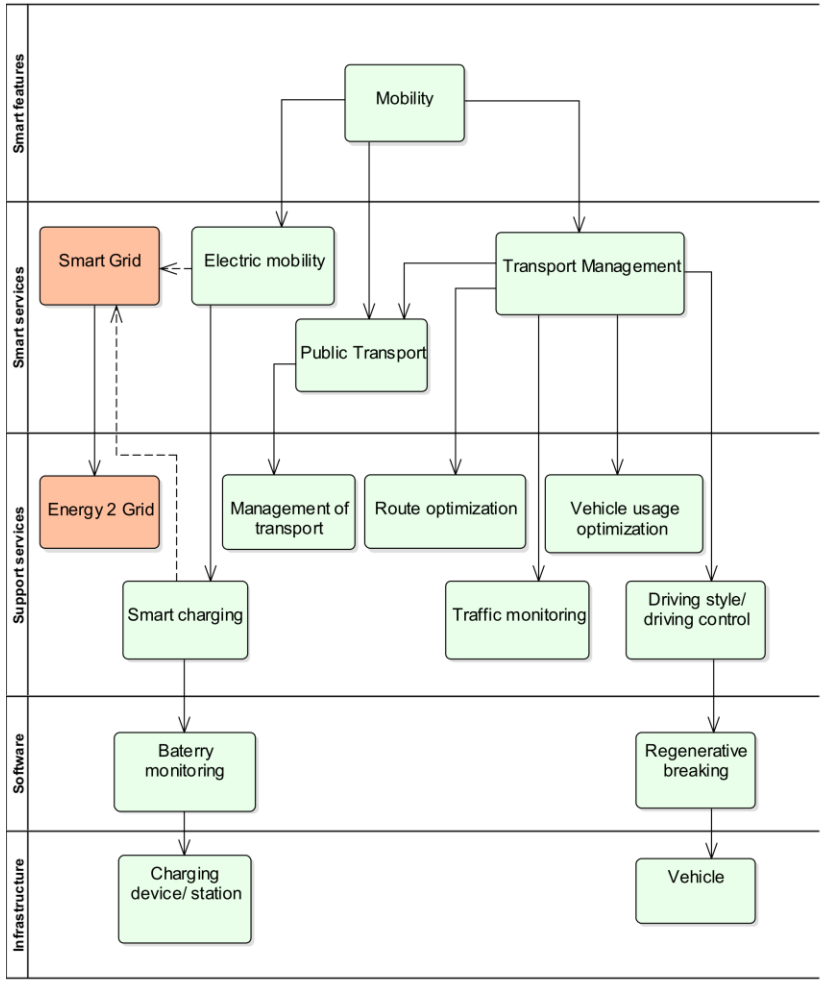
Detailed Layer analysis



Urban planning



Smart Energy

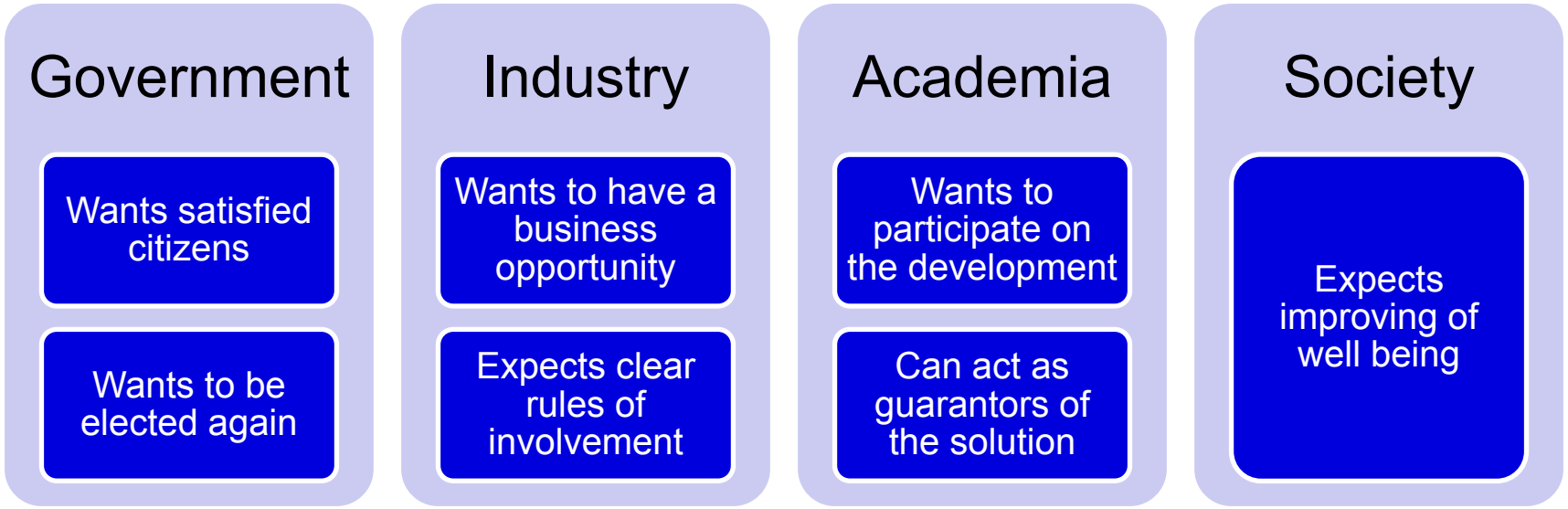


Mobility

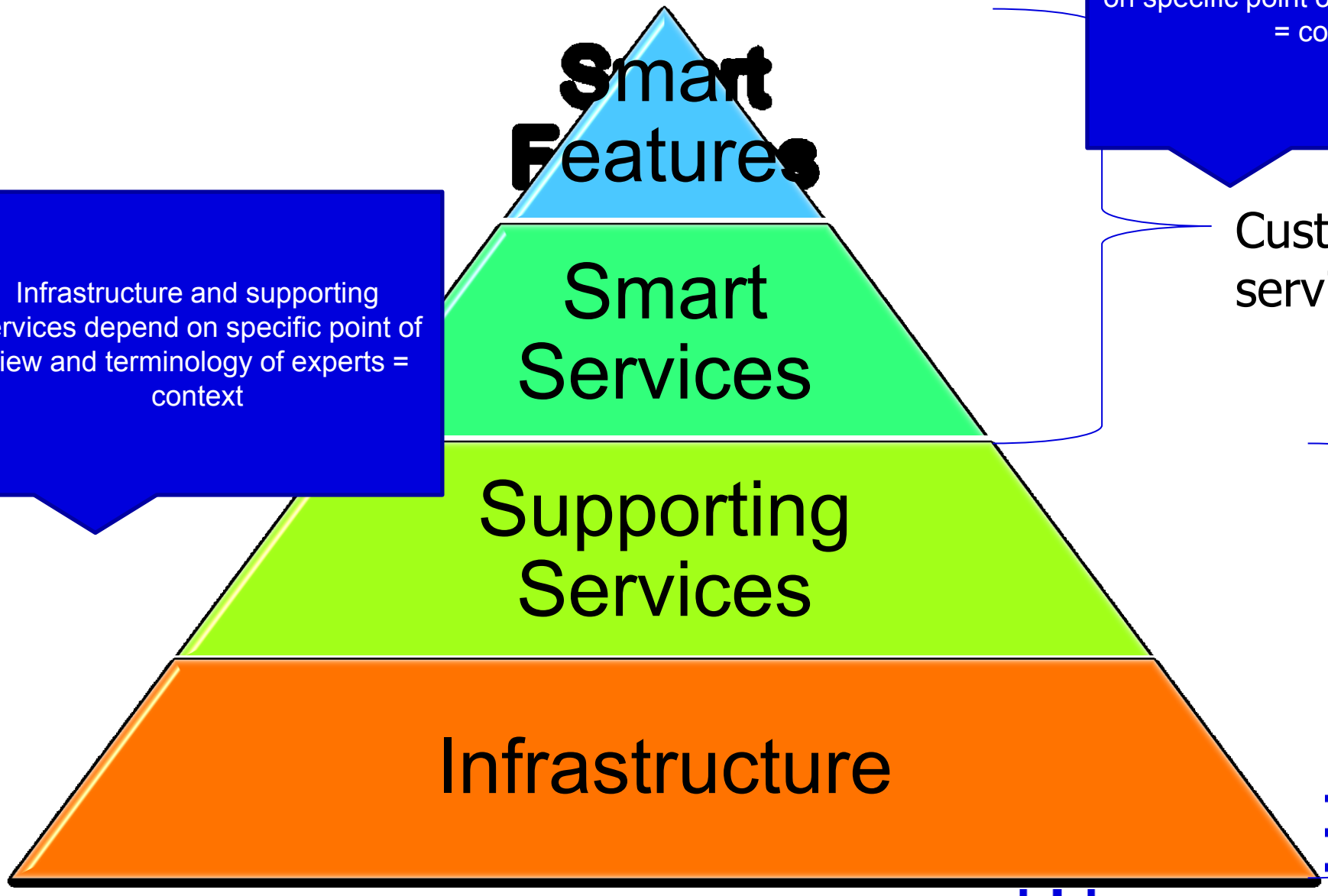
Laboratoř servisních systémů

Complexity of Smart City

- the environment of Smart City is not truly objective – it is a mix of different contexts, based on the interactions of actors in a stated moment
- the main problem is how to merge different perspectives described by the quadruple helix



New developed model



Smart feature and services depend on specific point of view of customer = context

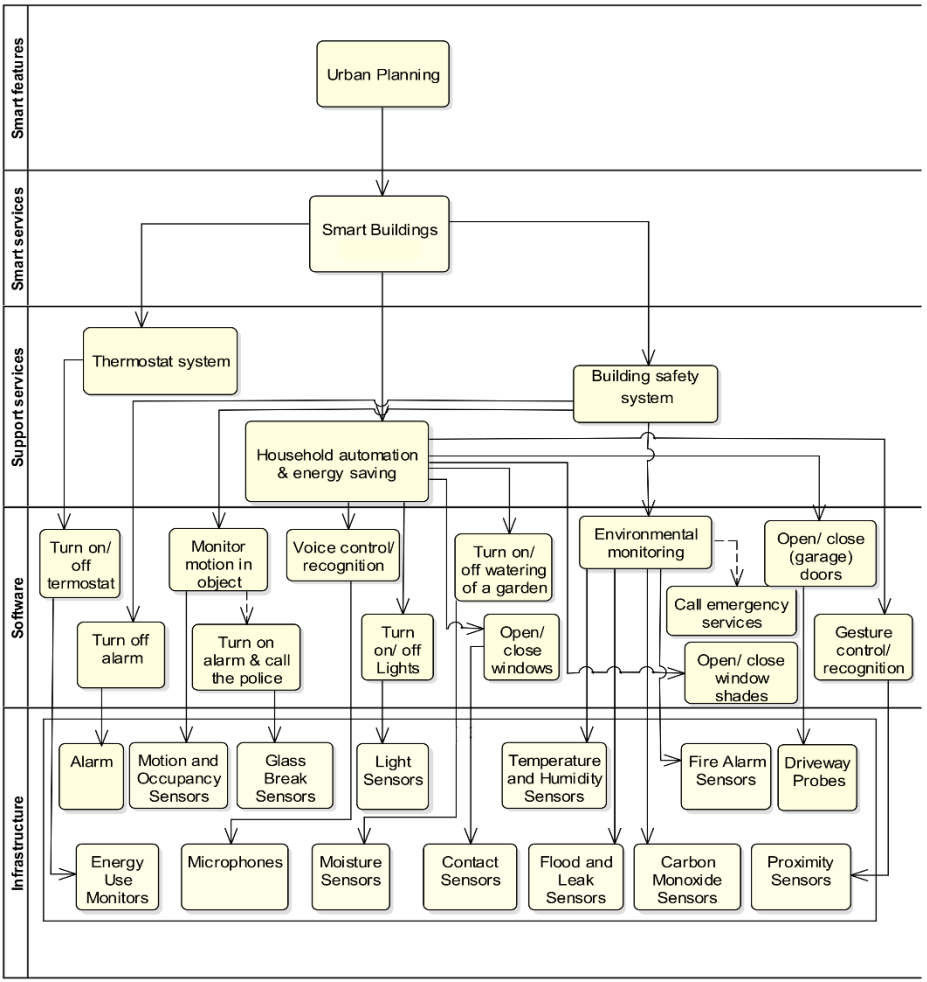
Customer facing services

Infrastructure and supporting services depend on specific point of view and terminology of experts = context

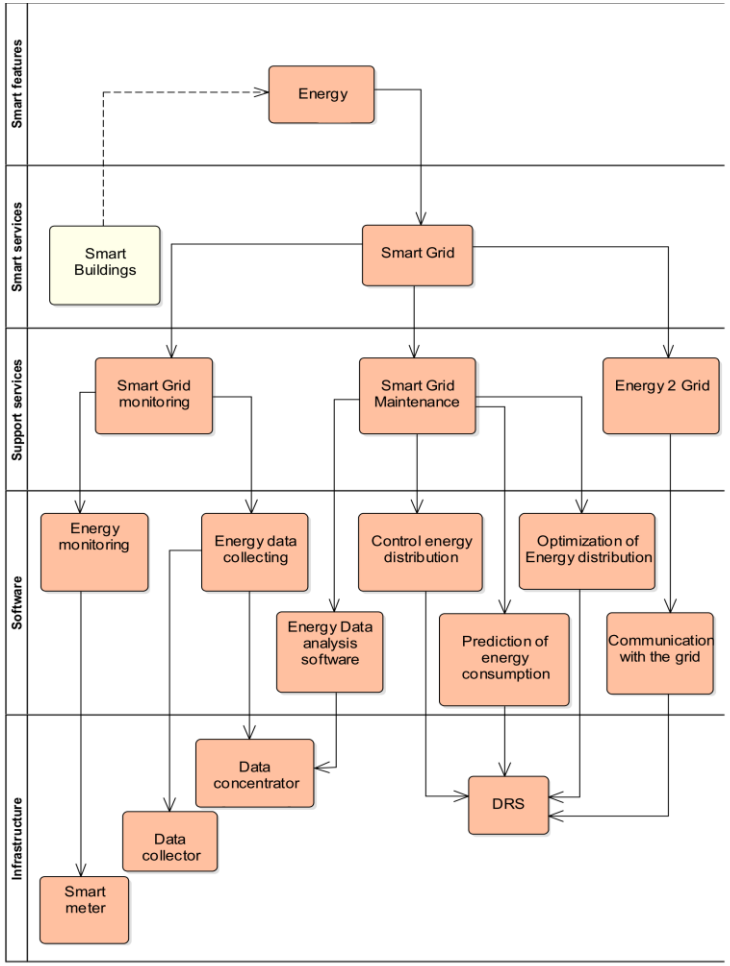
Background services

Laboratory of Service Systems

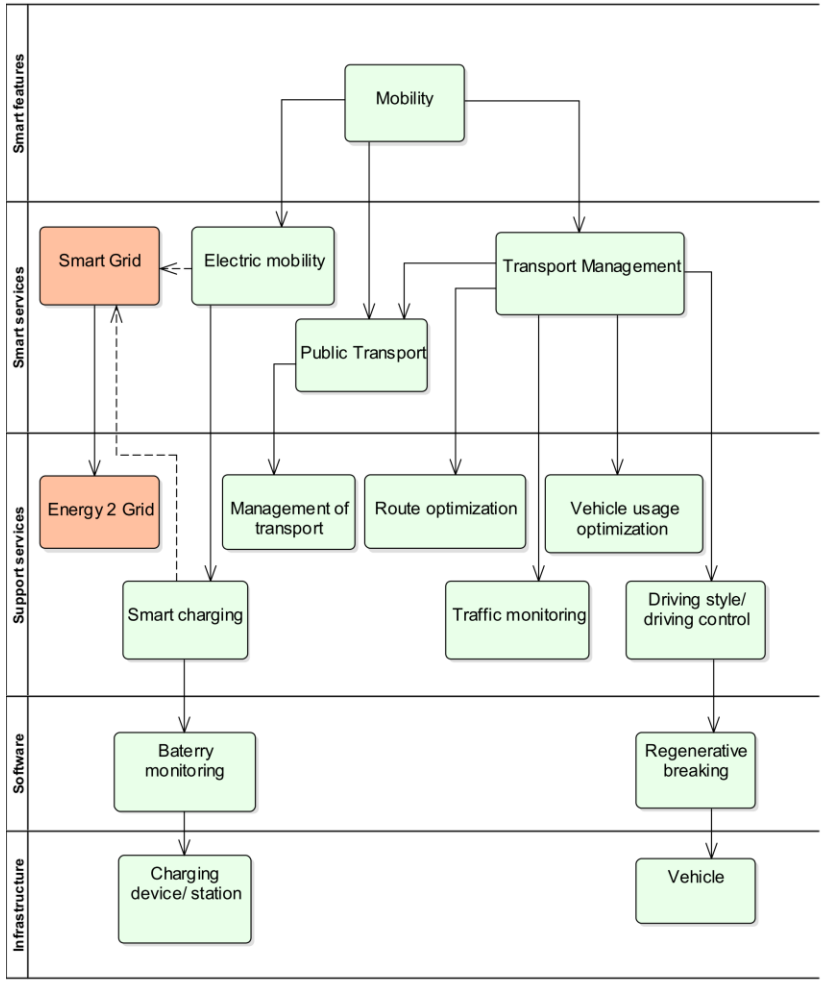
Detailed Layer analysis



Urban planning



Smart Energy



Mobility

Laboratoř servisních systémů

How to model such complex environment?

We need to have universal tool to catch multicontextual relations

It should contain

- Analysis of perception
- Analysis of stakeholders´ motivation
- Analysis of service provision

The main questions

- 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?

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?

Laboratory of Service Systems

How do we model reality in our heads?

We identify...

Object-s

...we find interesting

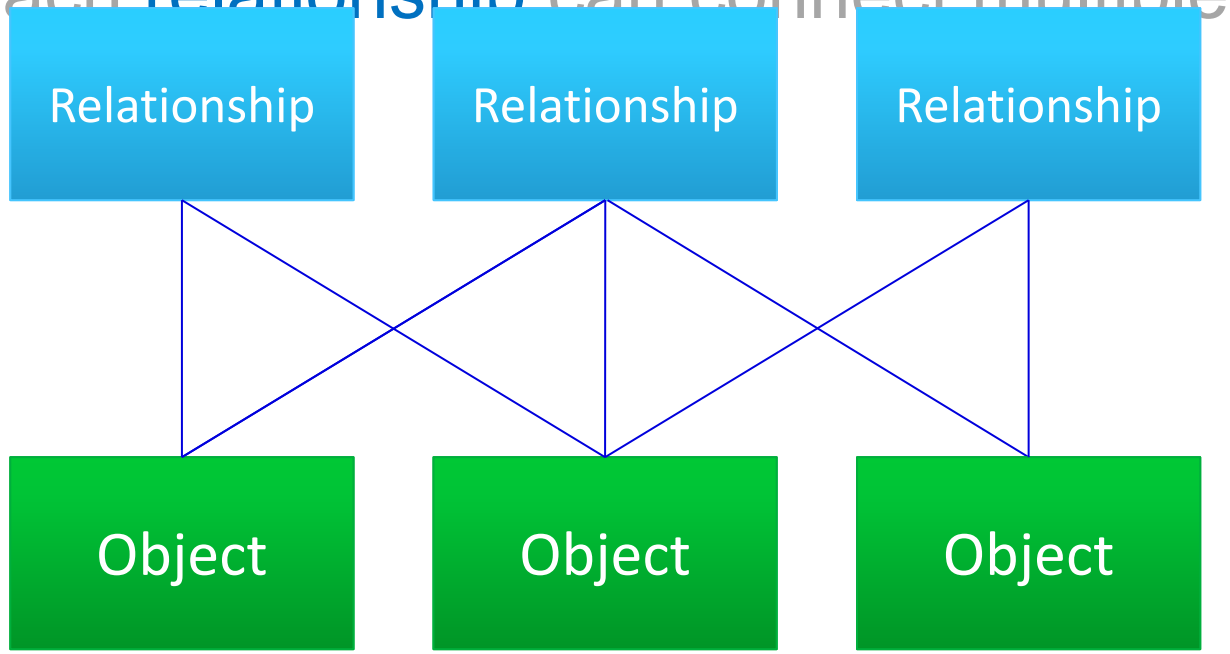
Relationship-s find...

...between our...

Object -s

Laboratory of Service Systems

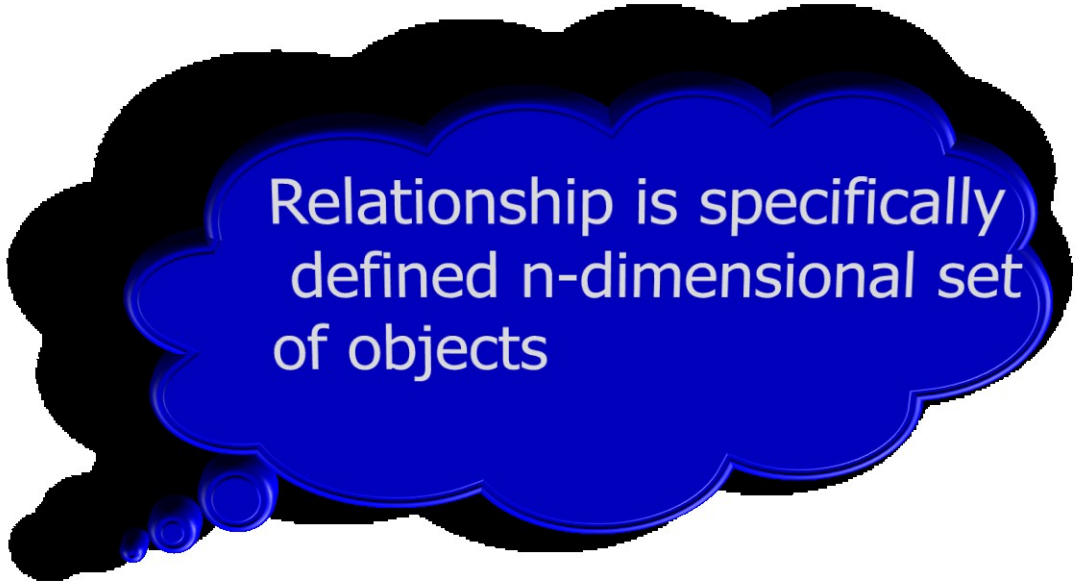
Each relationship can connect multiple objects...



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

Laboratory of Service Systems

Each relations



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

Laboratory of Service Systems

ects

Relationship

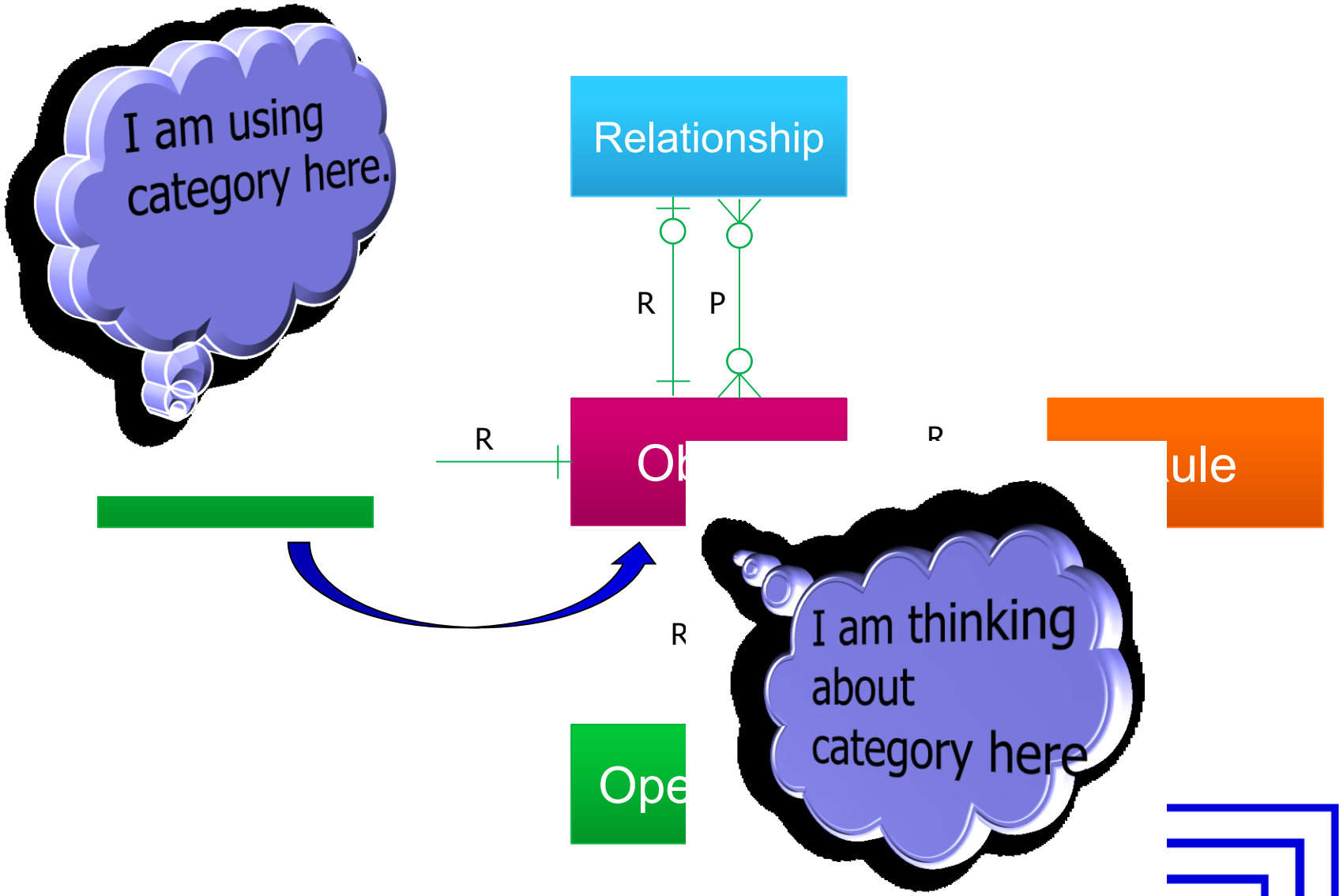
nteres

Category

Operation

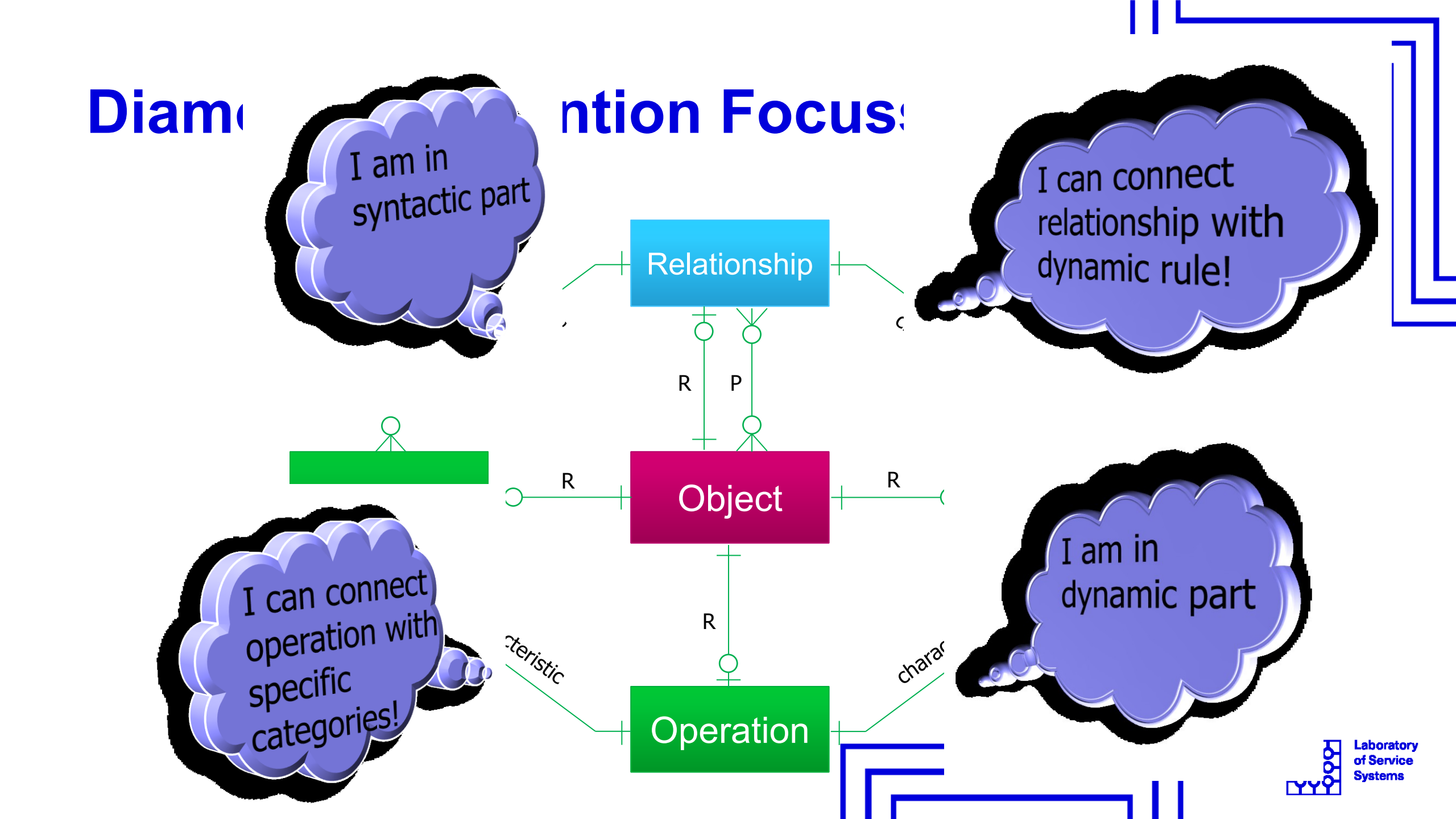
Laboratory of Service Systems

MENTION – USE duality



Laboratory of Service Systems

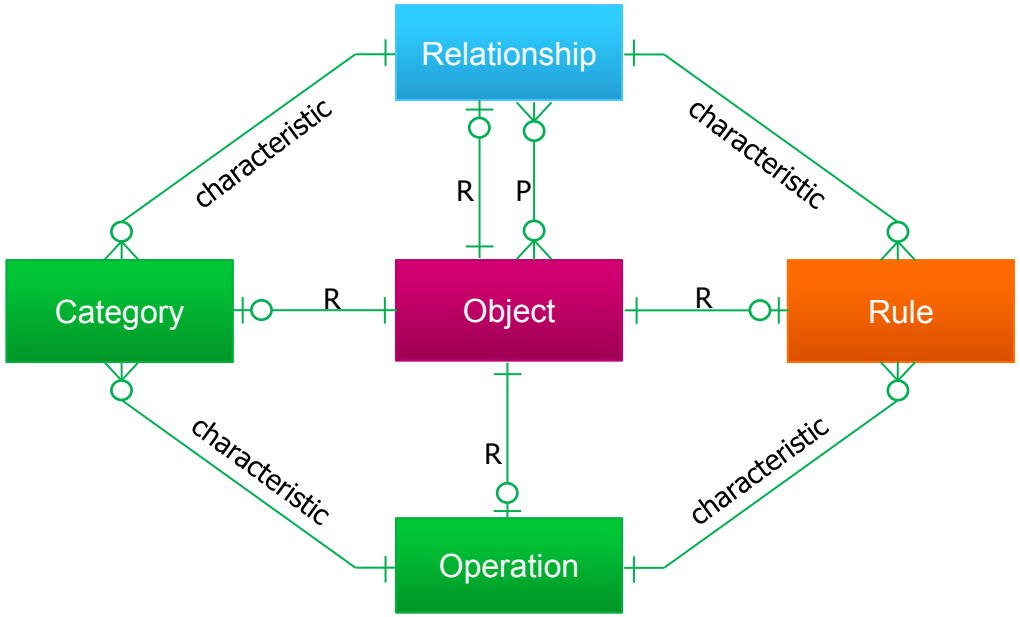
Diam ntion Focus



Laboratory of Service Systems

Diamond of Attention Focussing

- Objects and relationships between them
- Mention-use duality
  - Modelling a modelling tool
  - Referring to itself



Laboratoř servisních systémů

Road (street) - Objects and relationships

Name	Relationship	Name
Car	Is on	Road
Bus	Is on	Road
Bicycle	Is on	Road
Pedestrian way	Is on	Road
Driving lines	Are dividing	Road
All vehicles	Are using	Driving lines
Trafic on the road	contains	All vehicles
Trafic lights	Are managing	Traffic on the road

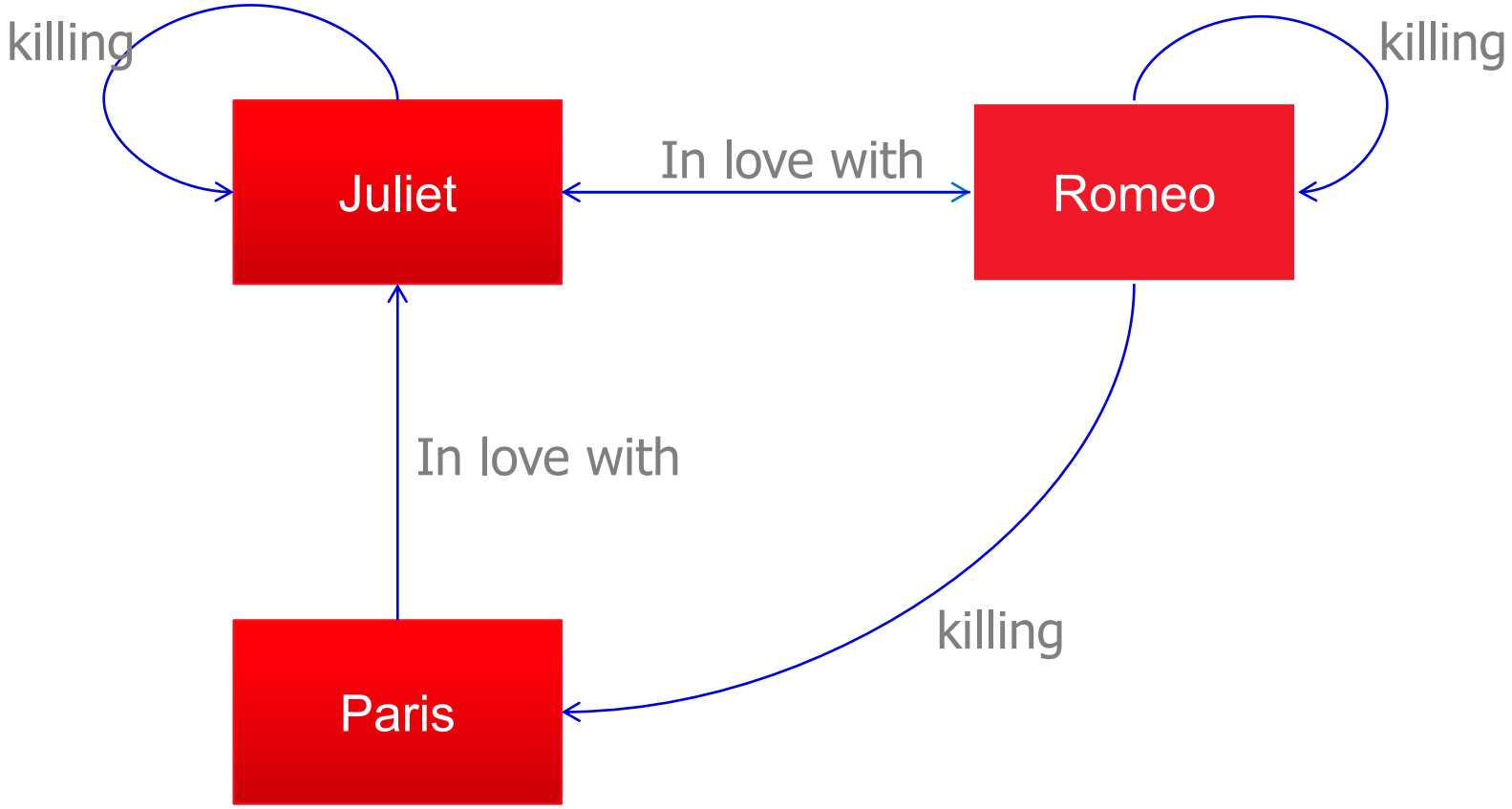
What to do next

If we want to understand complexity, we need to have holistic approach

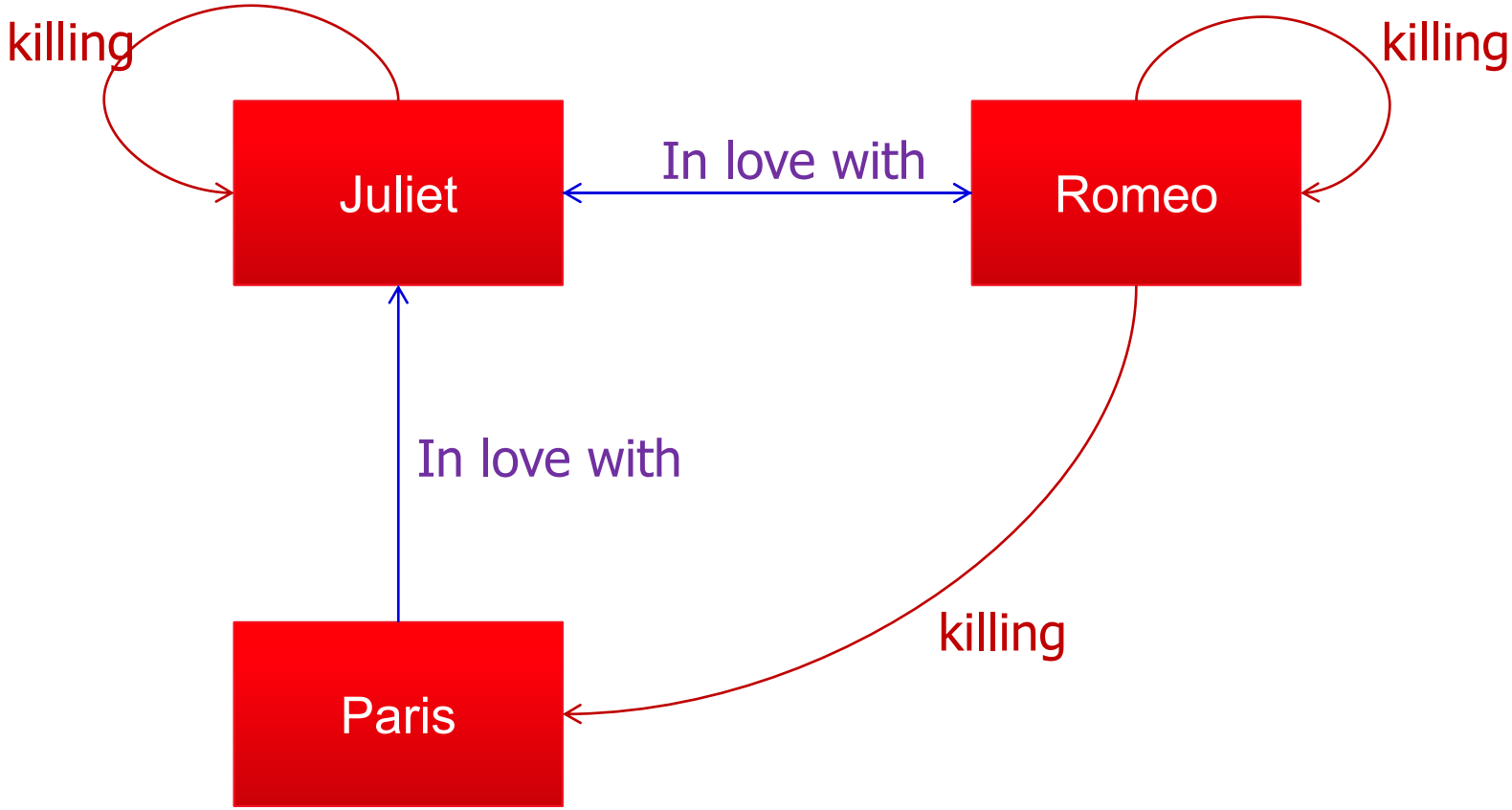
What is a holistic approach?

- In a medical setting, a holistic approach to problem solving refers to addressing the whole person, including their physical, mental, and emotional health, while taking social factors into consideration.
- In problem solving, a holistic approach starts by first identifying an obstacle, then taking a step back to understand the situation as a whole.
- In service environment, a holistic approach means to understand the value of the service from different perspectives, from the all important stakeholders point of view, to analyze overlaps to the other domains and take them into the consideration
  - Interdisciplinary approach
  - we are facing to the **problem of classification**

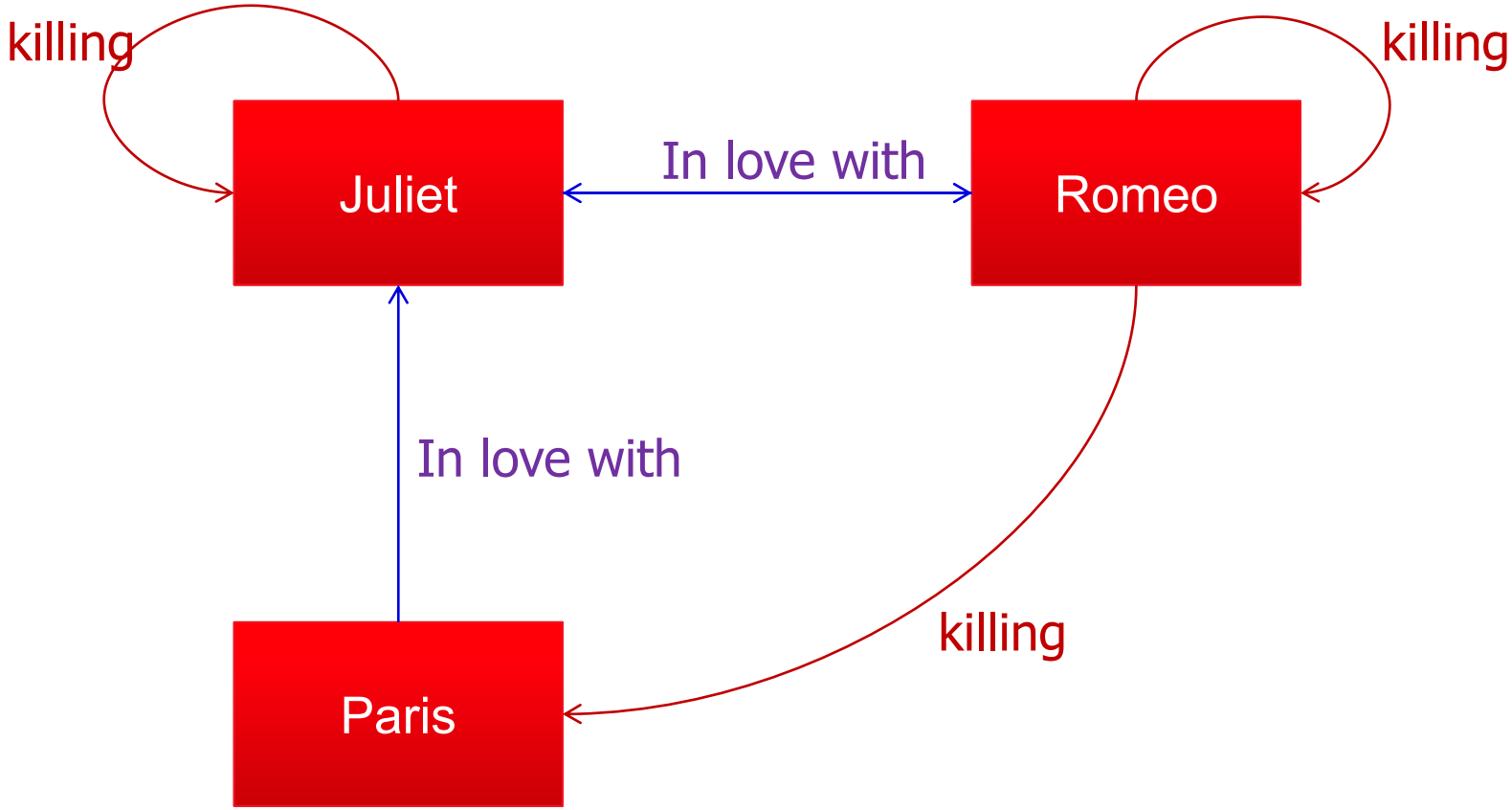
Classification example



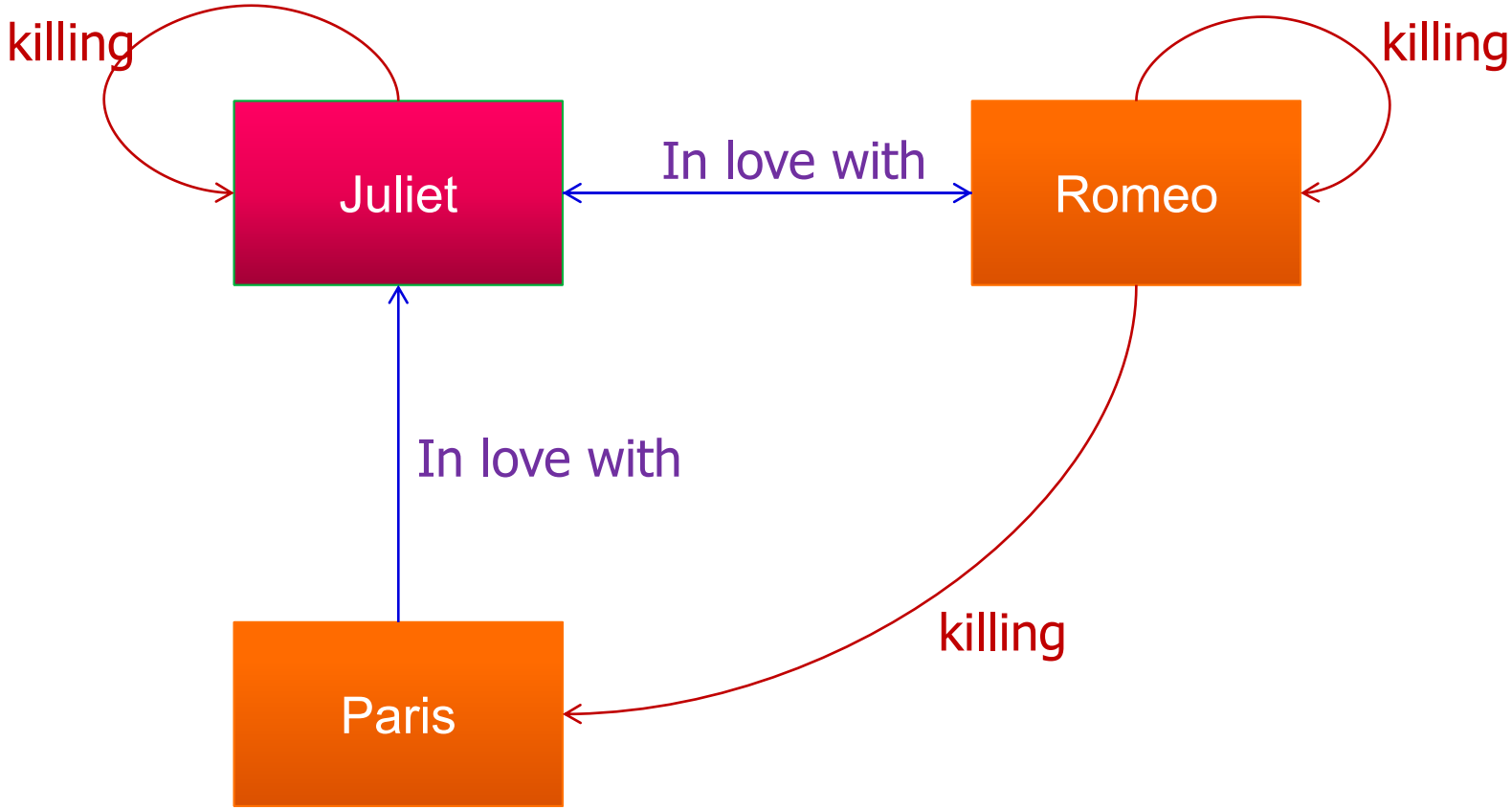
We can see that some connections are somehow similar – they belong to the same category:



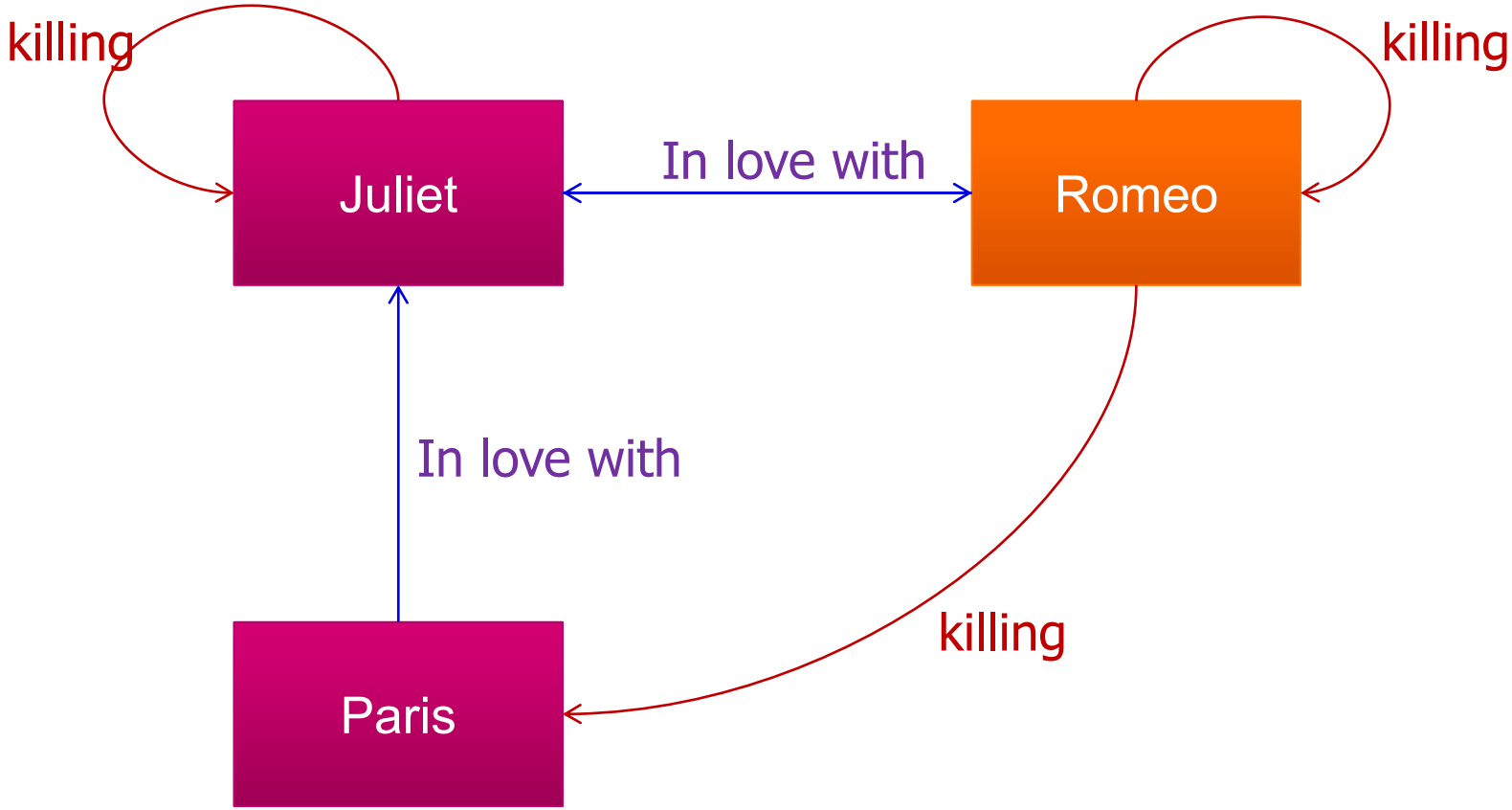
It‘s possible to classify everything we see in the diagram. But how to classify our objects?



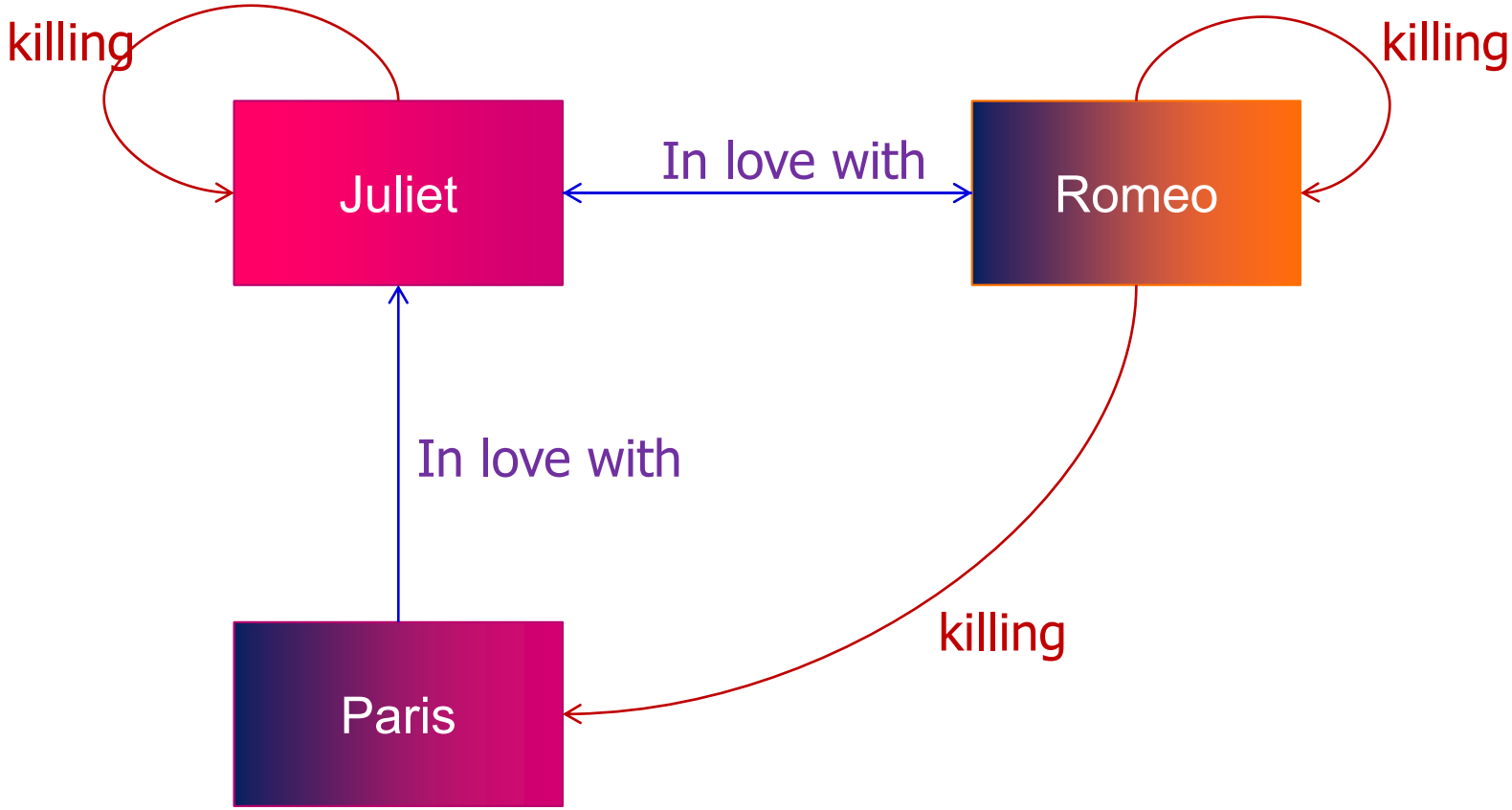
We could certainly divide the objects to men and women:



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:



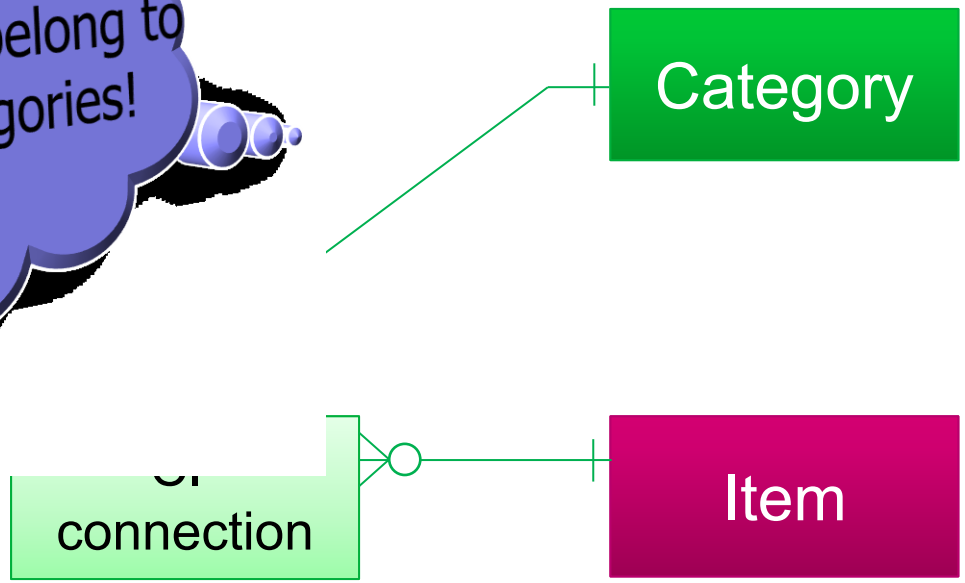
Classifications are blurred

Good or bad?

Laboratory of Service Systems

Certainty

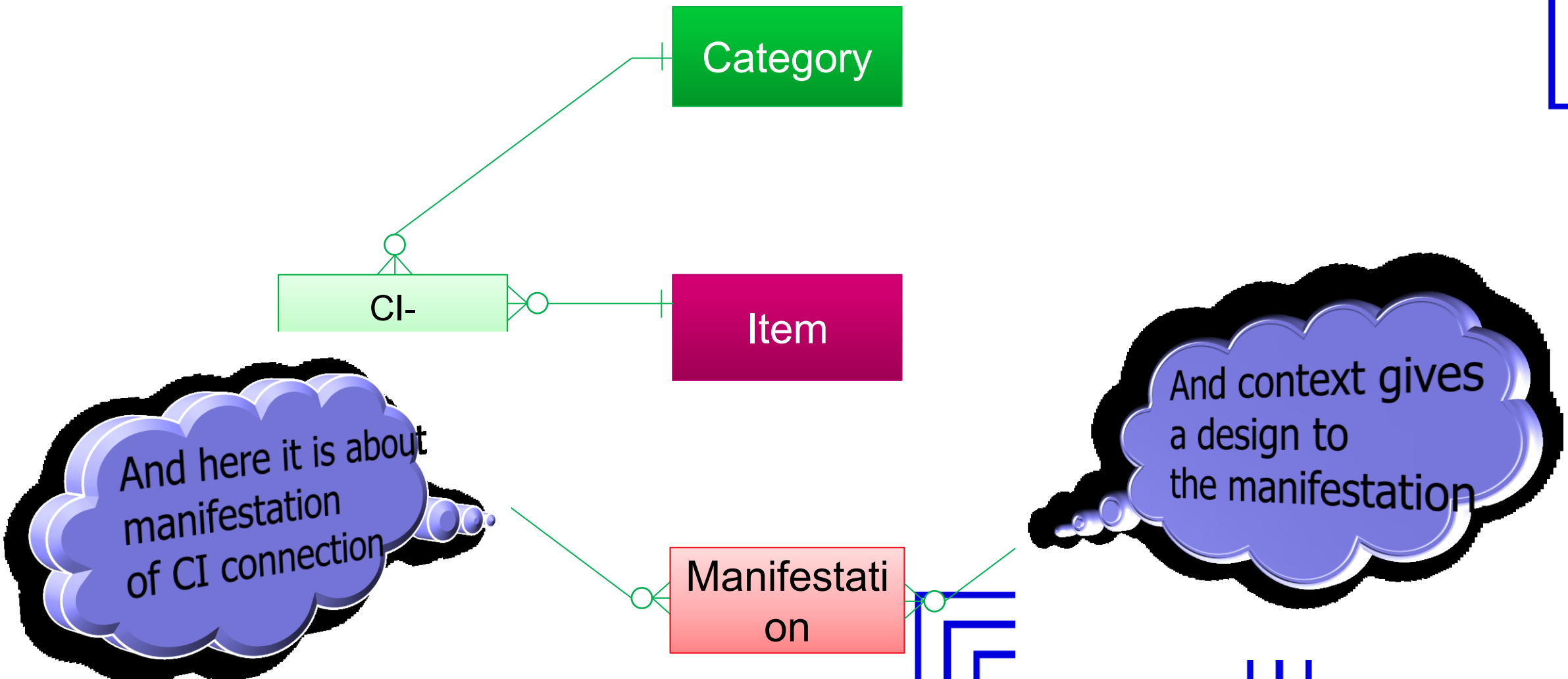
ns (= objects as such, not their constructs) belongs to a
egory with a given certainty



Laboratory of Service Systems

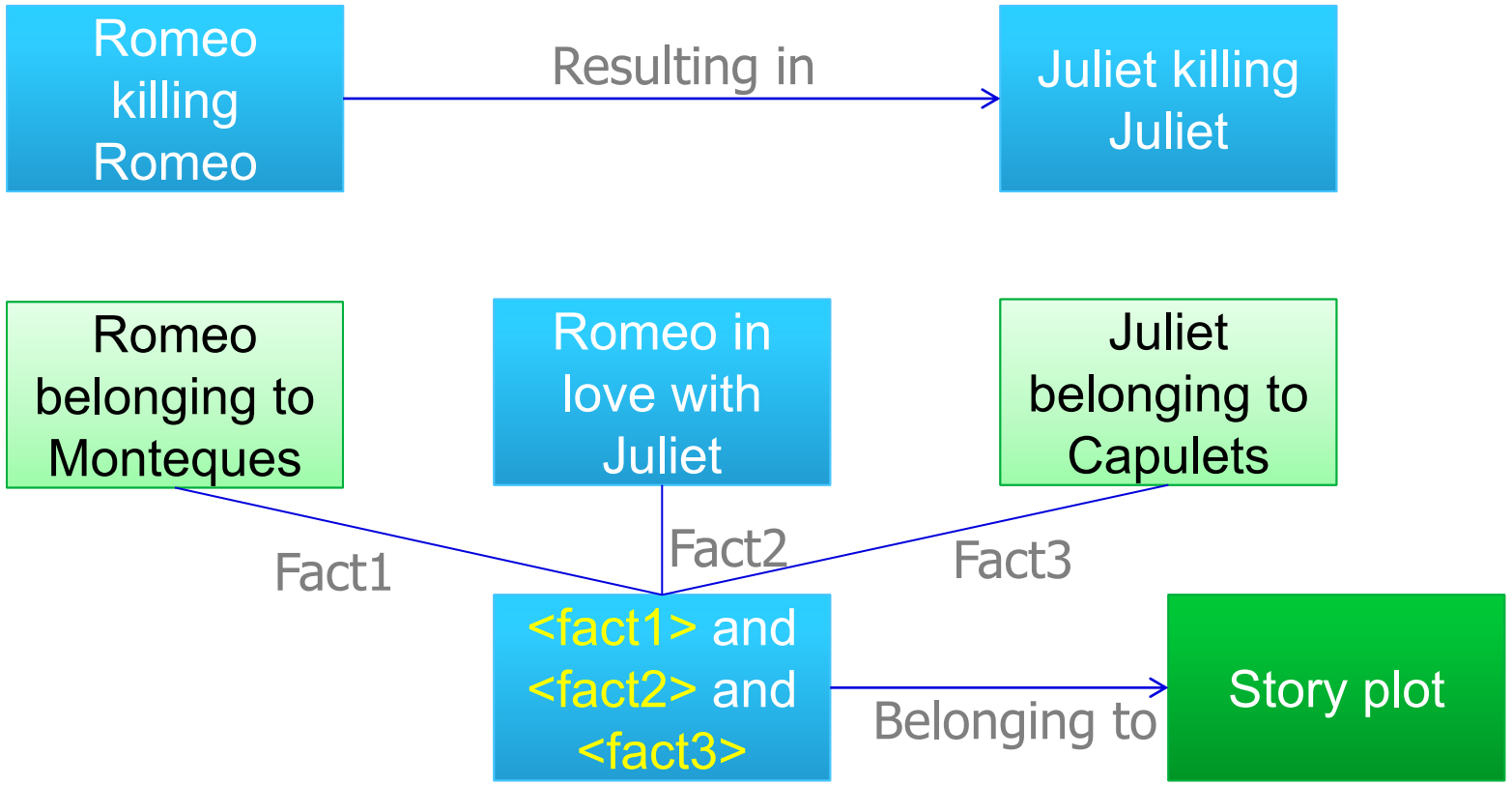
Attention

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

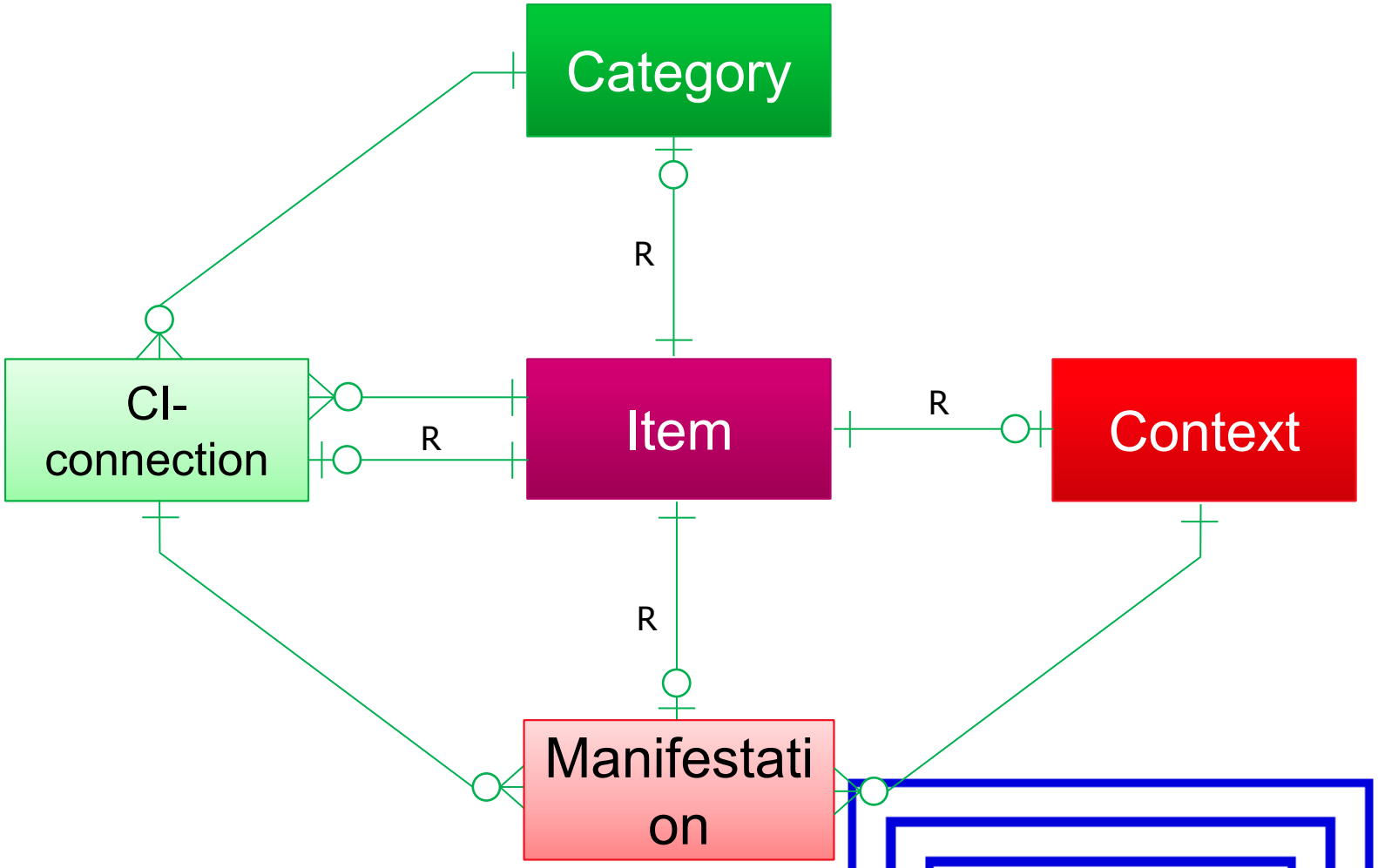


R-edges

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



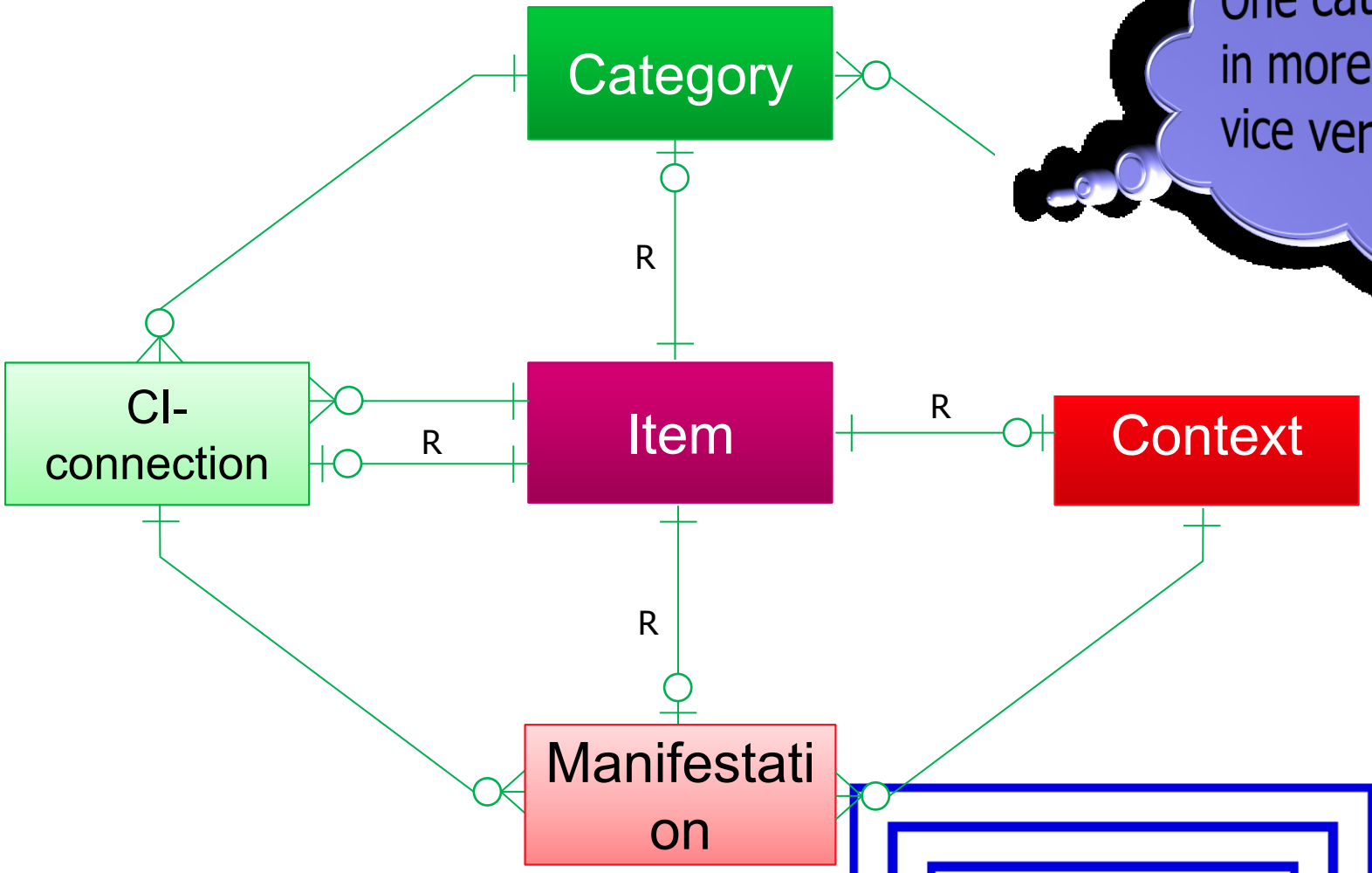
R-edges



Laboratory
of Service
Systems

Context base

Context serves as a mode
the set of categories to cla



One category can exist in more contexts and vice versa.

Laboratory of Service Systems

Independent models

Geography

Geography: Context

Sahara: Manifestation

Sand desert: CI-connection

Sand: Category

Desert: Item

Restaurant: Context

Sacher Cake: Manifestation

Sweet desert: CI-connection

Sweet: Category

Restaurant

Laboratory of Service Systems

Examples of manifestation of DATA

IT	• is any sequence of one or more symbols given meaning by specific act(s) of interpretation
Common understanding	• individual units of information.
Star Trek	• A character

Laboratory of Service Systems

Why we need it?

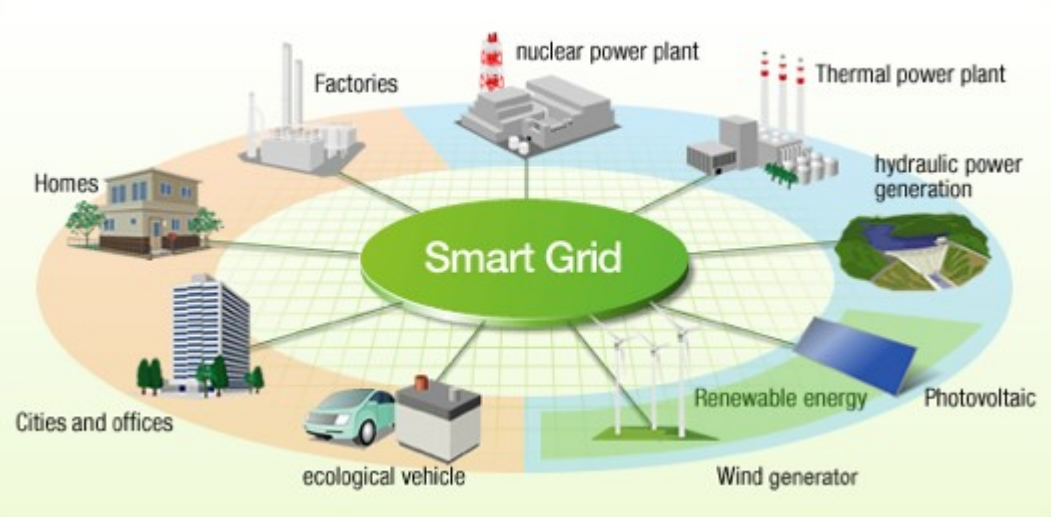
In the complex service environment (like Smart City) only one perspective is not enough

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



Laboratory of Service Systems

Example of smart street categories and objects

Street parts	Safety	Public transport	IT Devices	Vehicles
• Driving lines • All vehicles • Traffic on the road • Traffic lights • Parking slots	• Cameras • Pedestrian way • Pedestrian blocks • Speed sensor • Smart Screen	• Bus • Bus stop • Ticket machine • Tram line • Smart Screen	• Cameras • Smart Screen • Traffic lights • Traffic sensor • Pollution sensor • Ticket machine	• Car • Bicycle • Bus • Tram

Conclusion

Contexts

Diamond See and Recognize, their elements and relationships

Mention and Use duality

Examples and differences

Acknowledgement

- This presentation was improved by using Microsoft Copilot