What have we learnt so far?

- Use case diagrams
- Scenarios
- Activity diagrams
- Domain class diagram
- Sequence and collaboration diagrams
- Analysis class diagram
- Object diagrams
- Package diagram
- OCL

They form Models of the system.
And what are Models, after all?

1

Metamodel

2

Models and metamodels

- A model is a "description or analogy used to help visualize something that cannot be directly observed" [Merriam-Webster Online Dictionary]
  - models are used for describing, visualizing, and observing
  - models describe a system from different viewpoints, for different stakeholders, at different levels of abstraction
- Models are mainly used for communication
  - ability to convey unambiguous meaning is essential
  - need for an underlying model behind the model ➔metamodel

3

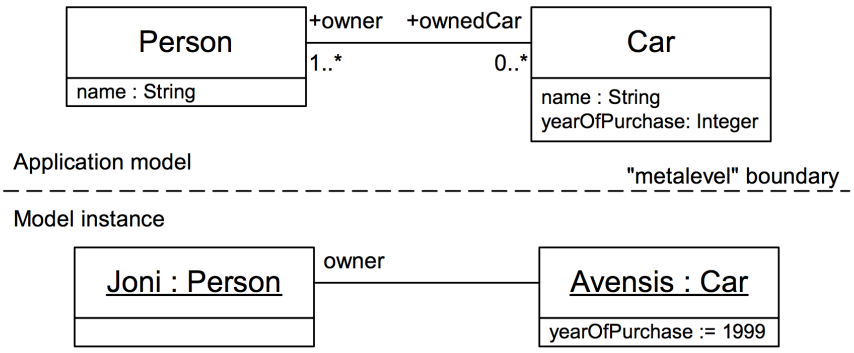
Metamodels

- Metamodels describe models (i.e., metamodel instances)
  - meta-elements, their properties and relationships
  - well-formedness rules for the instantiated models
  - in essence, an abstract syntax for models!
- A metamodel should describe the semantics for the meta-elements and thus the meaning of a metamodel instance
  - in practice, abstract syntaxes are given more emphasis…

4

Conceptual example

- Conceptually, a class diagram can act as a metamodel for an object diagram:



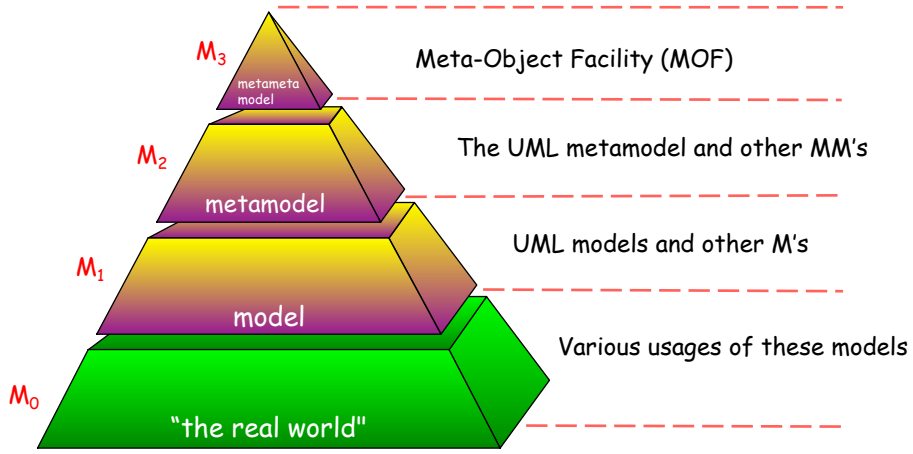
5

Metamodel

- **Metamodel** is a model that defines the language for expressing a model [Meta-Object Facility (MOF) standard]
- A metamodel defines a modelling language
- UML metamodel is defined in MOF
  - MOF = Meta-Object Facility

6

OMG metamodel architecture



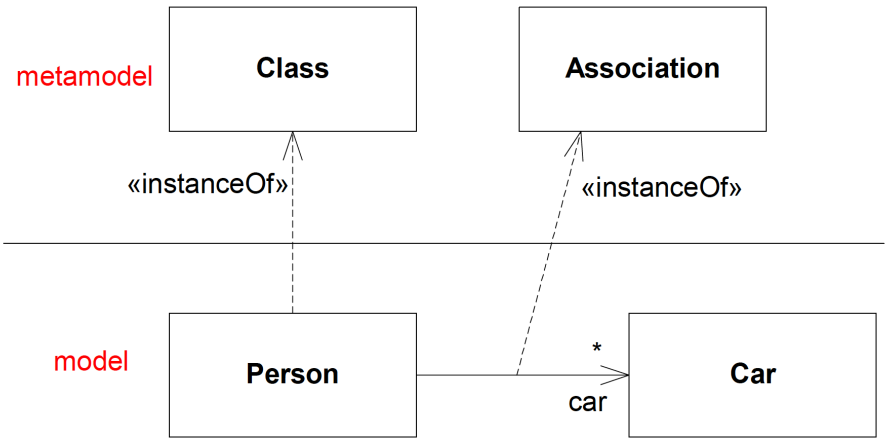
7

4 Layer Metamodel Architecture

	Layer	Description	Examples
M_3	**Meta-metamodel**	✓Foundation for a Metamodeling Architecture. ✓Defines the language to describe metamodels	MetaClass, MetaAttribute, MetaOperation
M_2	**Metamodel**	✓An Instance of a meta-metamodel. ✓Defines the language to describe models.	Class, Attribute, Operation, Component
M_1	**Model**	✓An Instance of Metamodel. ✓Defines a language to describe the information object domain.	Product, Unit Price, Customer, Sale, Detail
M_0	**User Objects (User Data)**	✓An Instance of a Model. ✓Defines specific information domain.	<Chair>, <Desk>, $100, $200

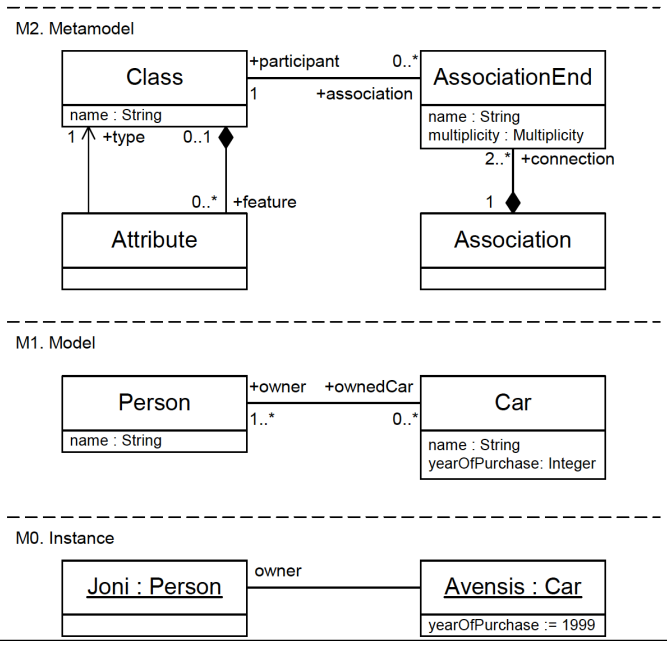
8

The relationship between metamodel and model



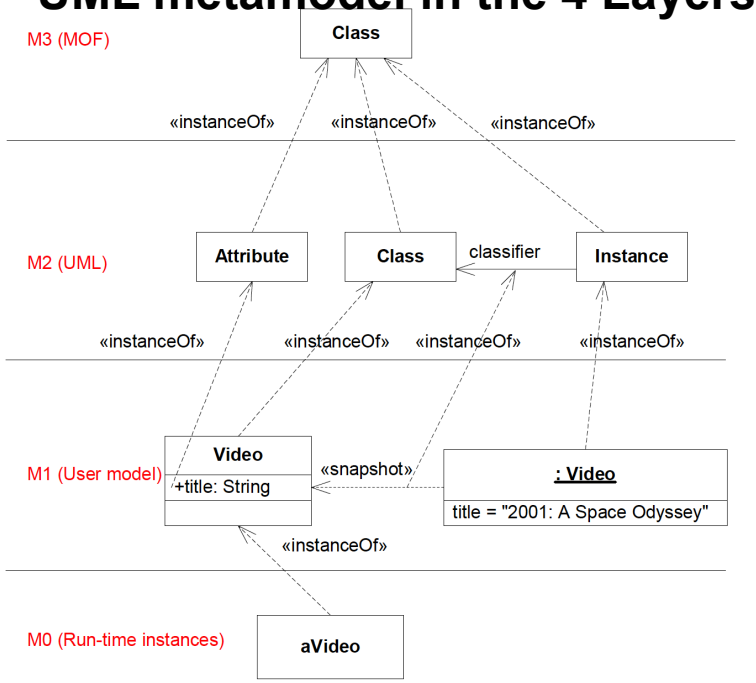
9

Three-Layer Example



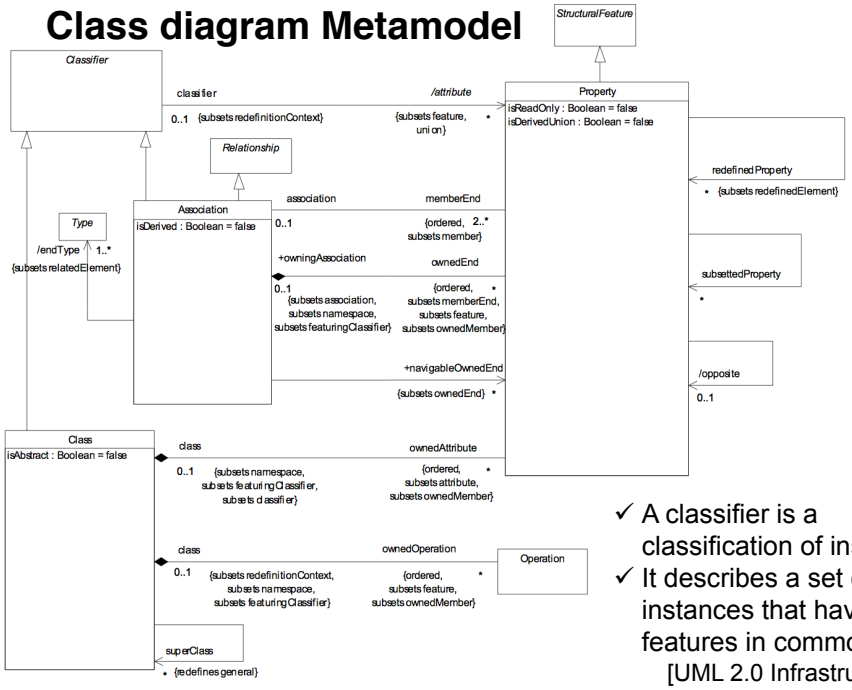
10

UML metamodel in the 4 Layers



11

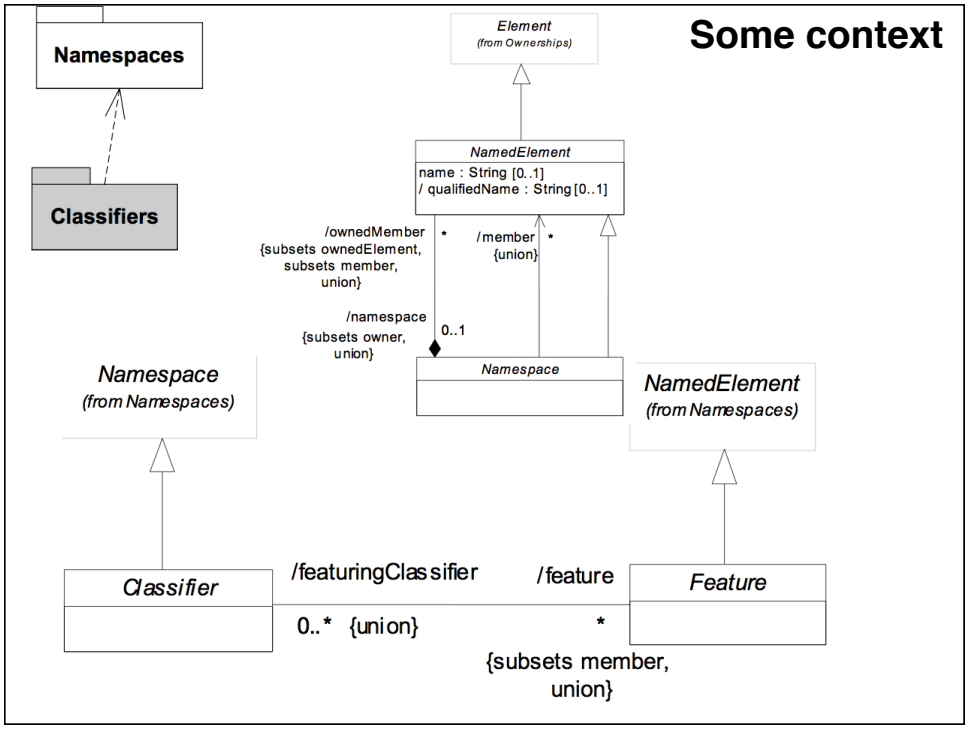
Class diagram Metamodel



- ✓ A classifier is a classification of instances
- ✓ It describes a set of instances that have features in common

[UML 2.0 Infrastructure]

12



References

- UML 2.0 Infrastructure
  - http://www.omg.org/cgi-bin/doc?ptc/2003-09-15
- UML 2.0 Superstructure
  - http://www.omg.org/cgi-bin/doc?formal/05-07-04

14