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# Object-Oriented Modeling: A Roadmap

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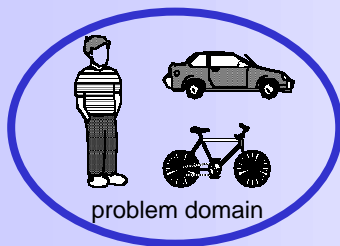
Gregor  
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Object-Oriented Modeling: A Roadmap



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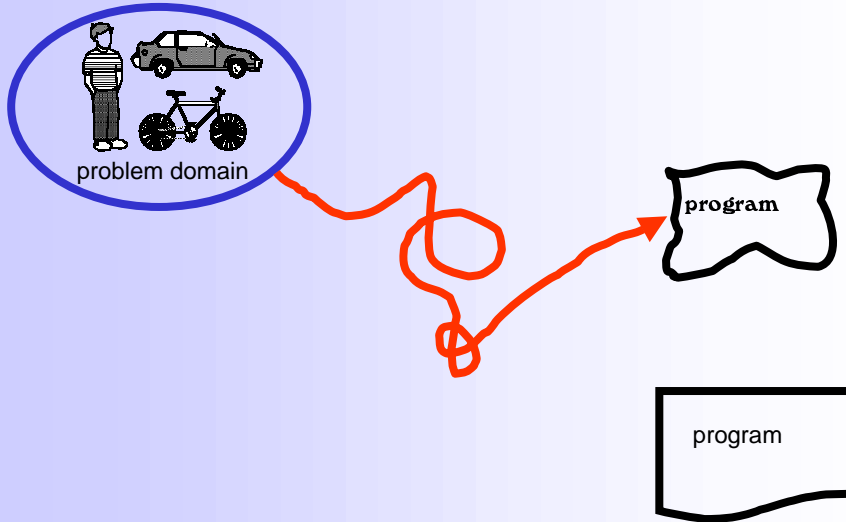
## Software Development: Traditional (?) Approach



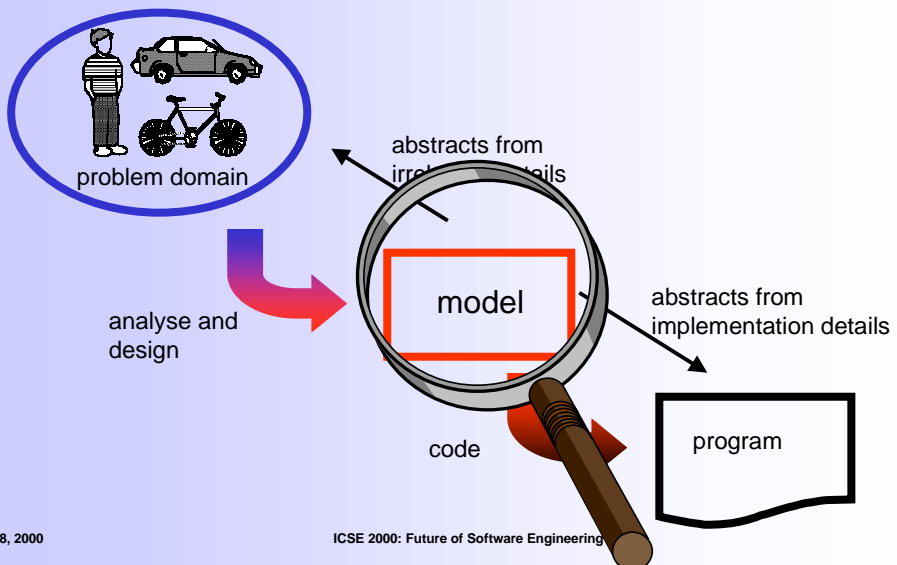
implementation



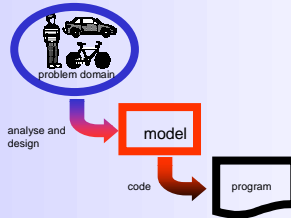
Software Development: Reality



Software Development: Model-centered Approach



Requirements for a Model and the Modeling Language



Requirements for a Model

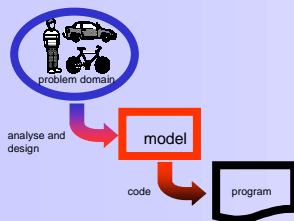
- user-friendly, understandable
- expressive
- correct, precise



Requirements for a Modeling Language

- visual, diagrammatic
- structure & behavior
- syntax & semantics

History of Modeling Languages



Historical Development

- ~ 70 Data Flow Diagrams (DFD) + Entity-Relationship Diagrams = Structured Analysis (SA)
- ~ 80 abstract data type: object-orientation
- ~ 90 > 50 object-oriented modeling languages
- ~ 00 standardization: Unified Modeling Language

## Unified Modeling Language (UML)

### Unified Modeling Language (UML)

**union of > 9 diagram types**

**structure:** class / object diagram

**behavior:** use case diagram  
statechart diagram  
activity diagram  
sequence diagram  
collaboration diagram

**implementation:** component diagram  
deployment diagram

**constraints:** object constraint language (OCL)



## Unified Modeling Language (UML)

### Unified Modeling Language (UML)

– **pushed by Rational**

- „three amigos“: Grady Booch, Jim Rumbaugh, Ivar Jacobson

– **standardized by OMG (Object Management Group)**

- version 1.1: november 1997
- version 1.3: autumn 1999
- version 2.0: under discussion

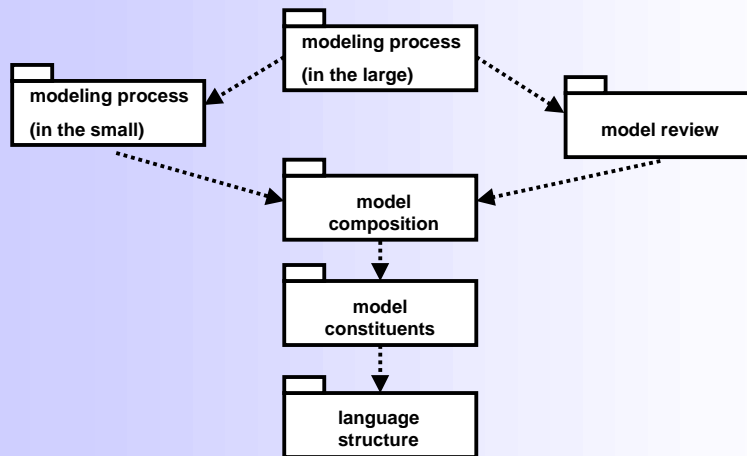
### Unified Process (RUP)



**This is not a talk about UML!**

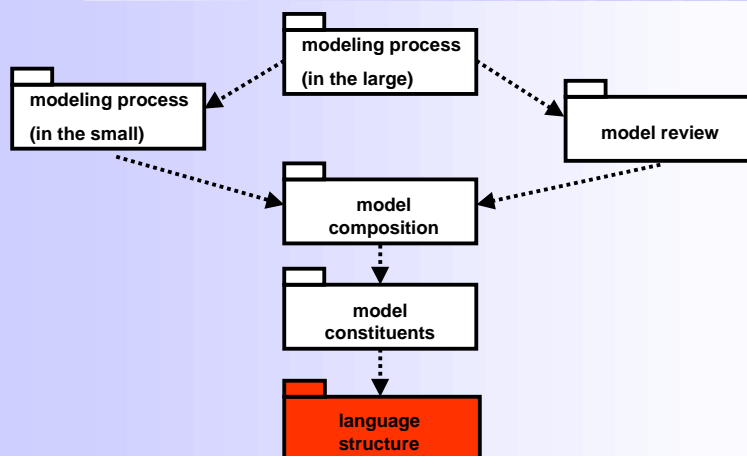
Perspectives - Open Issues

regions of the object-oriented modeling landscape

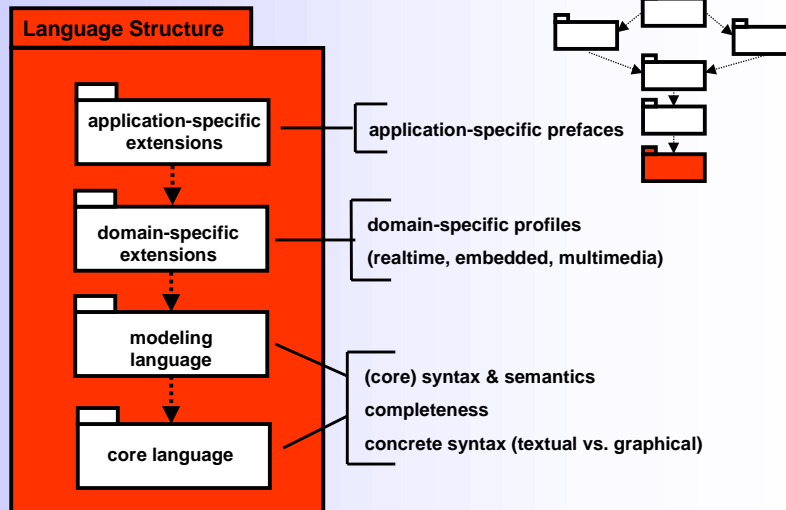


Perspectives - Open Issues

regions of the object-oriented modeling landscape



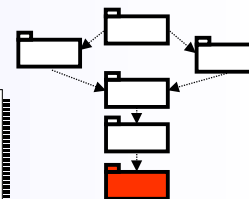
### Layered Language Structure



### Open Issues (1)

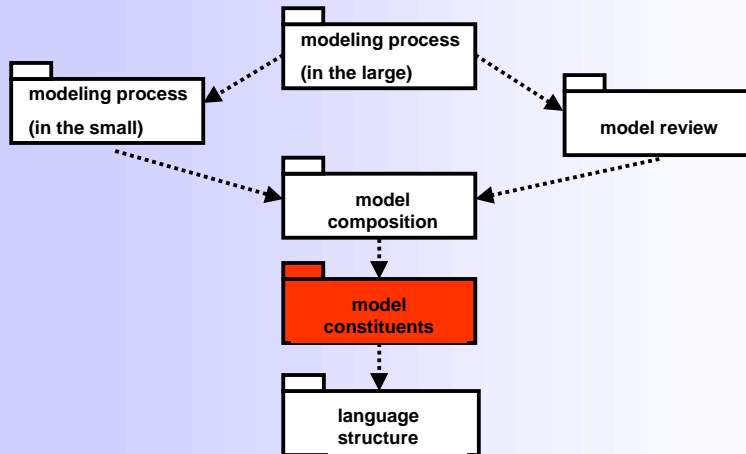
#### Open issues in the **Language Structure** region:

- language architecture (core vs. profiles)
- hybrid notations (textual vs. graphical)
- completeness, expressiveness
- semantics



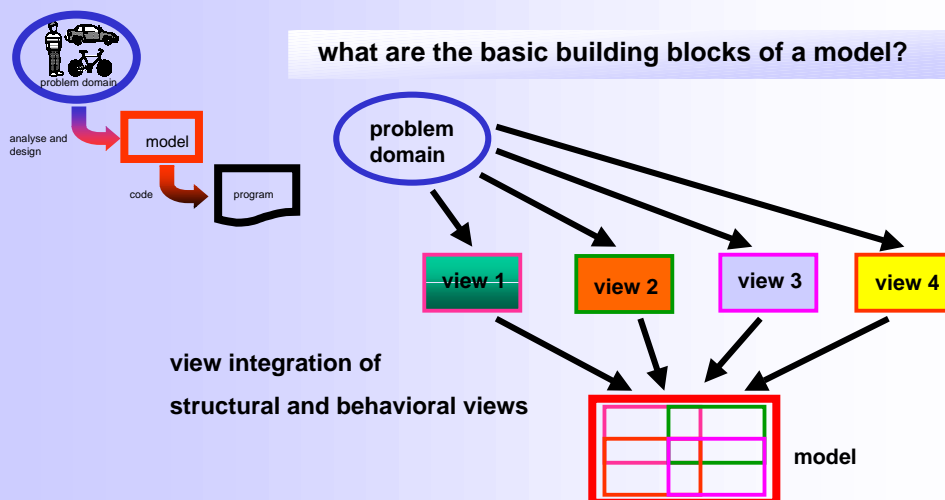
Perspectives - Open Issues

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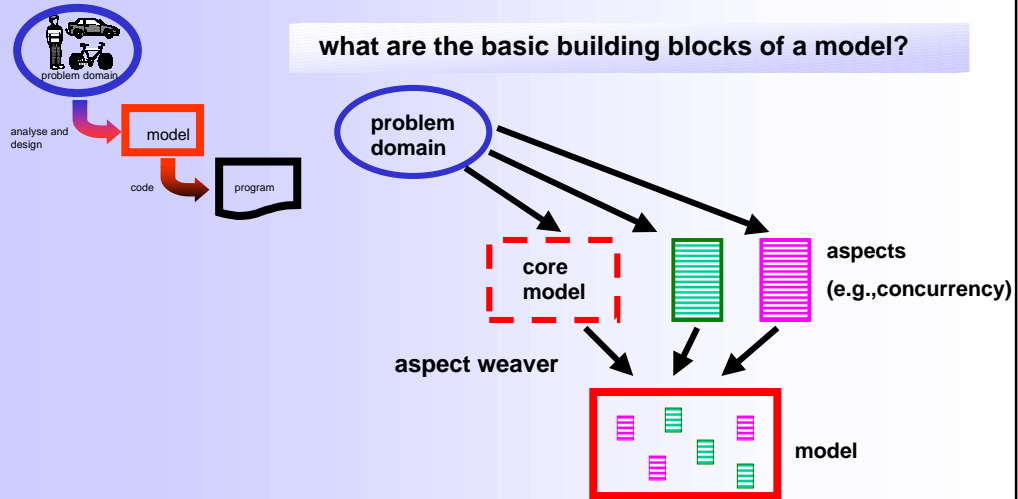


Model Constituents (1)

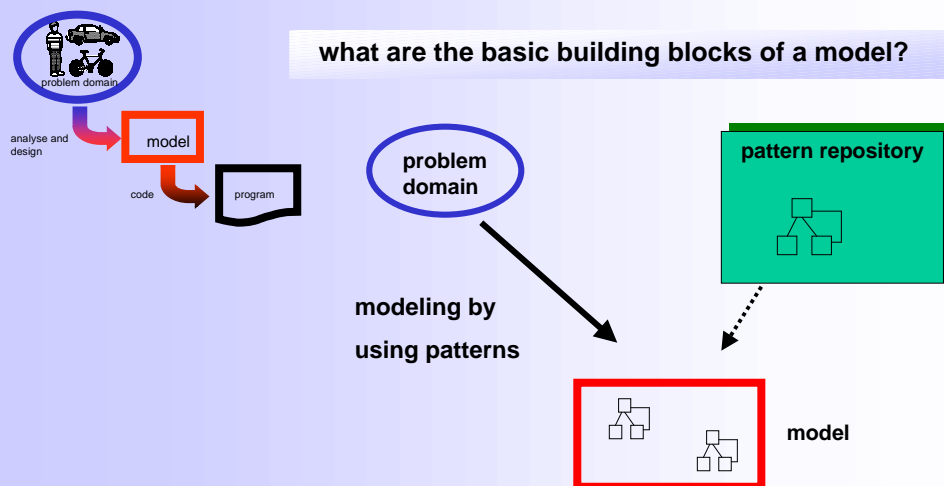
what are the basic building blocks of a model?



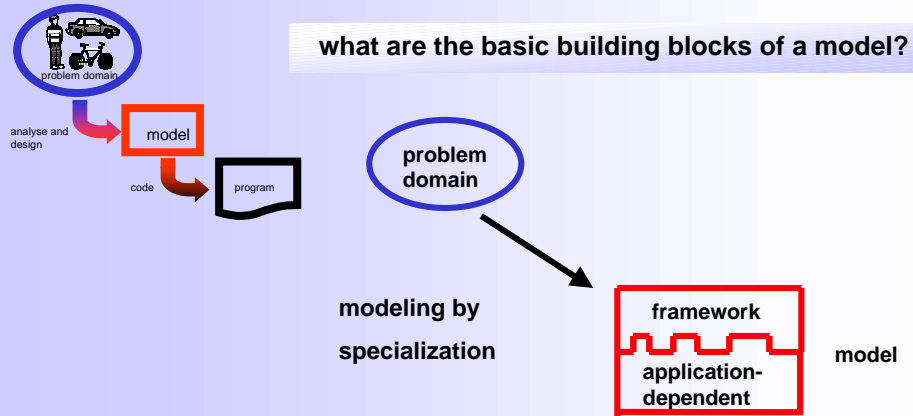
### Model Constituents (2)



### Model Constituents (3)



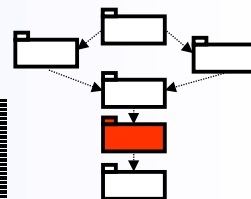
Model Constituents (4)



Open Issues (2)

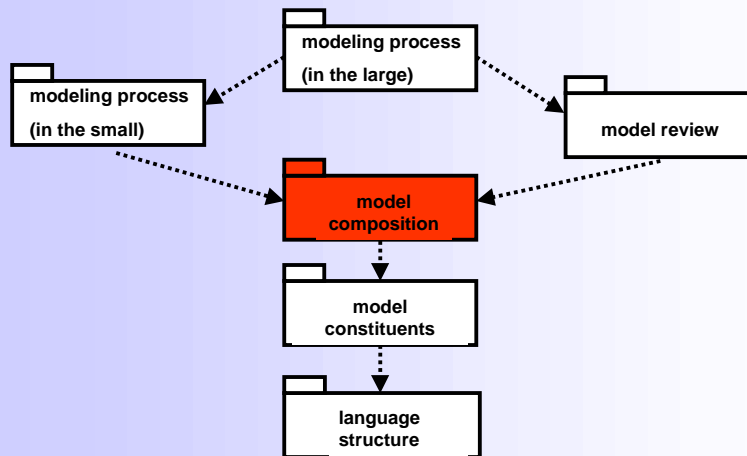
Open issues in the **Model Constituents** region:

- modeling units and their interdependencies
  - views
  - aspects, features
  - patterns
  - frameworks

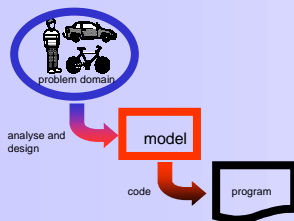


Perspectives - Open Issues

regions of the object-oriented modeling landscape



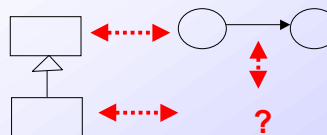
Model Composition



what are the means to compose models?

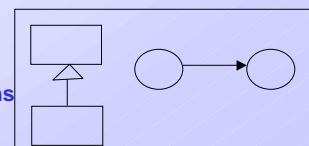
– horizontal composition

- adding/removing model parts

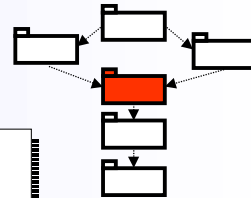


– vertical composition

- refinement
  - subsystems
  - class-like descriptions



Open Issues (3)

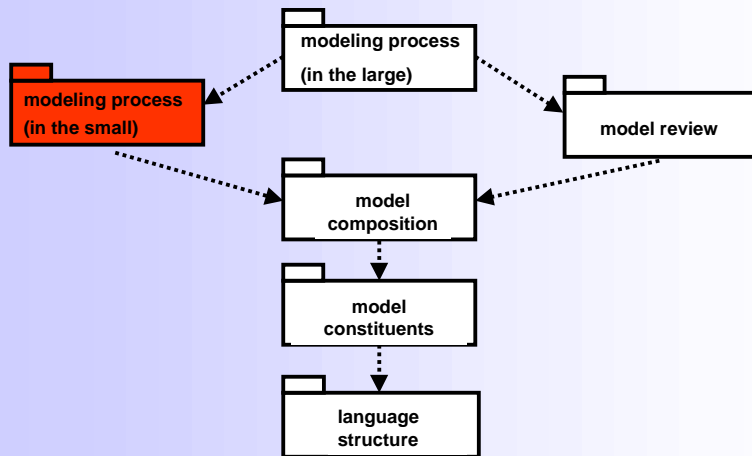


Open issues in the **Model Composition** region:

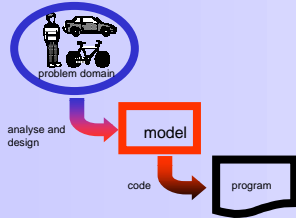
- scalability
- horizontal / vertical composition techniques

Perspectives - Open Issues

regions of the object-oriented modeling landscape



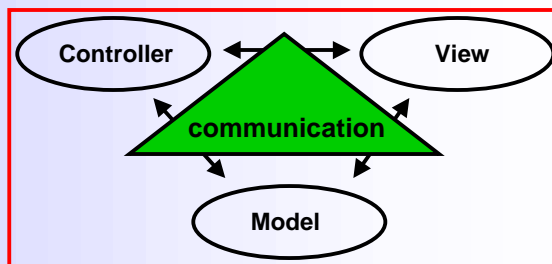
Modeling Process (in-the-Small)



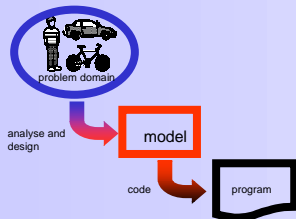
what are the tasks during composing a model?

- managing consistency between model parts
- determining model architecture

Model-View-Controller (MVC) Architecture



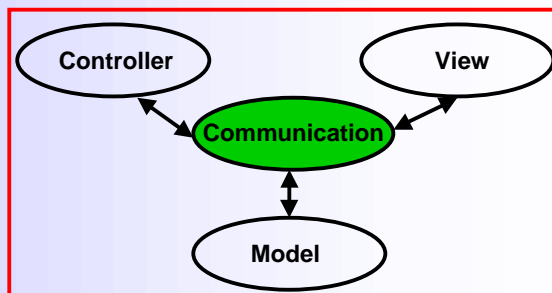
Modeling Process (in-the-Small)



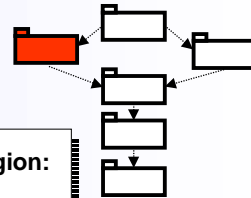
what are the tasks during composing a model?

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Model-View-Communication-Controller (MVCC)



Open Issues (4)

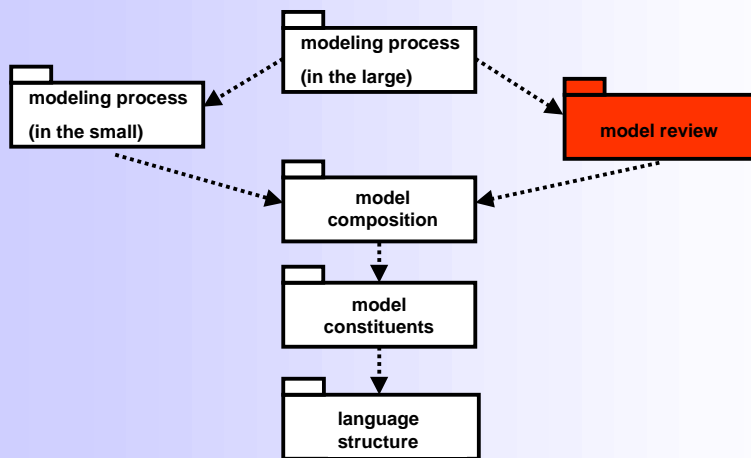


Open issues in the **Modeling Process (in-the-Small)** region:

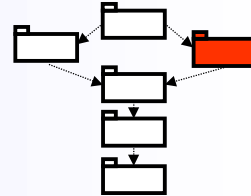
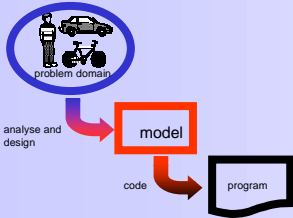
- consistency within the model
- modeling of coordination and communication

Perspectives - Open Issues

regions of the object-oriented modeling landscape



Open Issues (5)

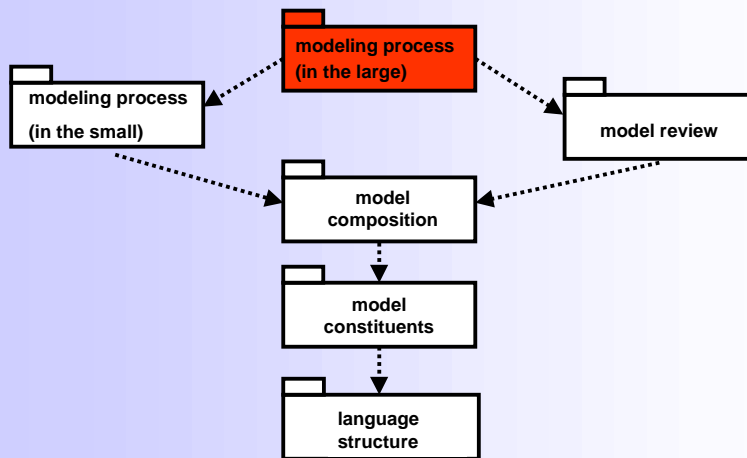


Open issues in the **Model Review** region:

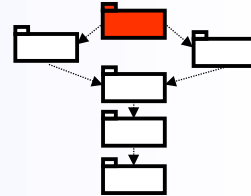
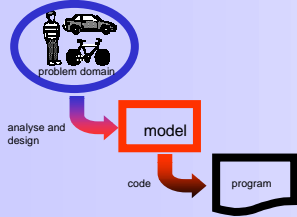
- animation / simulation techniques
- analytical techniques

Perspectives - Open Issues

regions of the object-oriented modeling landscape



Open Issues (6)

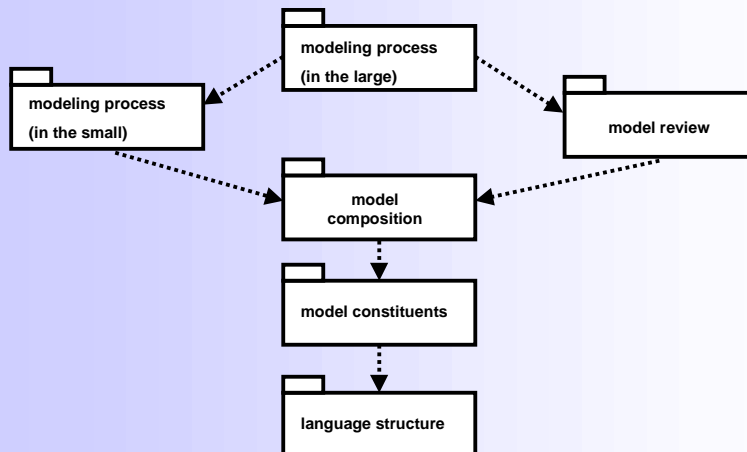


Open issues in the **Modeling Process (in-the-Large)** region:

- frond-end / back-end transformations
- round-trip engineering
- process models
- support tools

Conclusions (1)

regions of the object-oriented modeling landscape



## Conclusions (2)

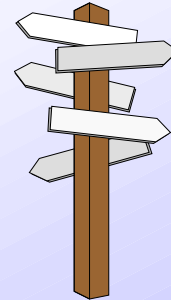
### Summary

- drawn a structured landscape
- identified a list of open issues

### Note:

a lot of individual solutions exist

### Challenge for the Future



\*Footnote: UML might be a good platform!

## Conclusions (3)

