

## Motivation

# A Rule-Based, Integrated Modelling Approach for Object-Oriented Systems

Benjamin Braatz

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- Goal: Precise, Constructive Object-Oriented Models  
(Necessary for Formal Semantics and Code Generation)
- Separation of Concerns:  
Structure, Local Changes, and Control Flow
- Declarative, Rule-Based Modelling to ease  
Comprehension



## Overview

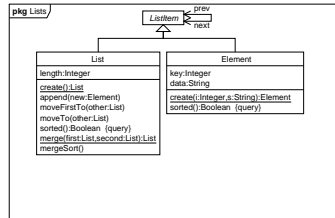
## UML Foundations

- 1 UML Foundations
- 2 Transformation Rules
- 3 Structured Flowcharts

- Class Diagrams for Structure
- Declaration of Entities of the Object-Oriented System  $\implies$   
Comparable to Signatures in Algebraic Specifications
- OCL Constraints for Queries
- Stateless Language without Side Effects  $\implies$   
Comparable to Functional Programming Languages



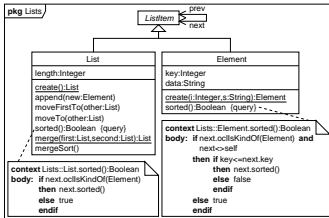
# Class Diagrams



- Classes and Associations
- Inheritance Structure
- Attributes
- Operations
- Static Operations
- Query Operations



# OCL Body Expressions

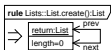


- OCL Body Expressions specify Queries
- if-then-else Constructs and Calls to other Queries
- Recursion



# Transformation Rules

- Declarative Modelling of Local Structure Changes
- Adaption of Graph Transformation for Object Structures
- Intuitive Notation with Precise Semantics (SPO or DPO)



- Constructors are Static Operations  $\Rightarrow$  Left-Hand-Sides are empty
- Right-Hand-Sides contain Constructed Object (return)
- Right-Hand-Sides use Parameters of Operation

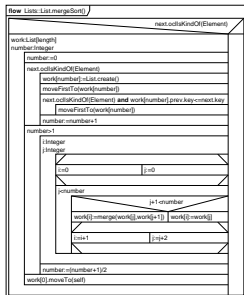


# Creation Rules



## Mergesort Operation

## Summary



- Local Variable Declaration
- Parallel Execution of Control Blocks

- Integrated Modelling Approach with Separation of Concerns
- Structure specified by Class Diagrams
- Queries specified by OCL Constraints
- Local Modifications specified by Transformation Rules
- Control Flow specified by Structured Flowcharts



## Future Work

## The End

- Formal Syntax given by Meta-Model and Typed, Attributed Graph Transformation
- Formal Semantics
- Extension by Descriptive Techniques with Verification Methods
- Refinement Concept

Thank You!

