

Railway Domain Modeling

Homework Assignment #3

Team GoMRP

MDSD 2015

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Homework specification

- Railway system
 - sections, turnouts and signals
 - trains
- Requirement: safe operation
 - prevent train collisions
 - prevent train derailment
- Homework Assignment 3
 - Discrete event-based simulator (DESMO-J)
 - Generate code from behavioral model
 - Extras: trace (with UI support), traceability

What does GoMRP stand for?

- Go stands for itself
- MRP???
- **M**odel **R**ailway **P**roject

Textual DSL Improvements

- Simple pretty-printing
- Include statement
 - Load Structural Model
 - Validate resource path

```
include
"platform:/resource/hu.bme.mit.inf.gomrp.simulation.
StateMachine Train for object James {

    Actions:
        ChangeTrainCurrentTrackElement CTCTE
        ChangeTrainHeadingSpeed CTHS
    EndActions

    Guards:
        SignalCurrentAllowedSpeed SCAS
        SignalCurrentAllowedSpeed SCAS_FALSE
    EndGuards

    Triggers:
        TrainTrackElementChanged TTEC
        TriggerExpression STEP {
            step
        }
    EndTriggers
}
```

- Scoping for StateMachine's referredObject
- No need for dummy RDM Textual DSL

Discrete event-based simulator I.

- Simulation core:
 - RailwaySimulationModel, SimulationRunner
- Entities:
 - Train
 - Section, Turnout, Station
 - Signal, TurnoutSignal
- Events:
 - Train[Front | Rear][Entered | Left]TrackElement
 - TurnoutDirectionChanged
 - Waiting[AtStation]Ended

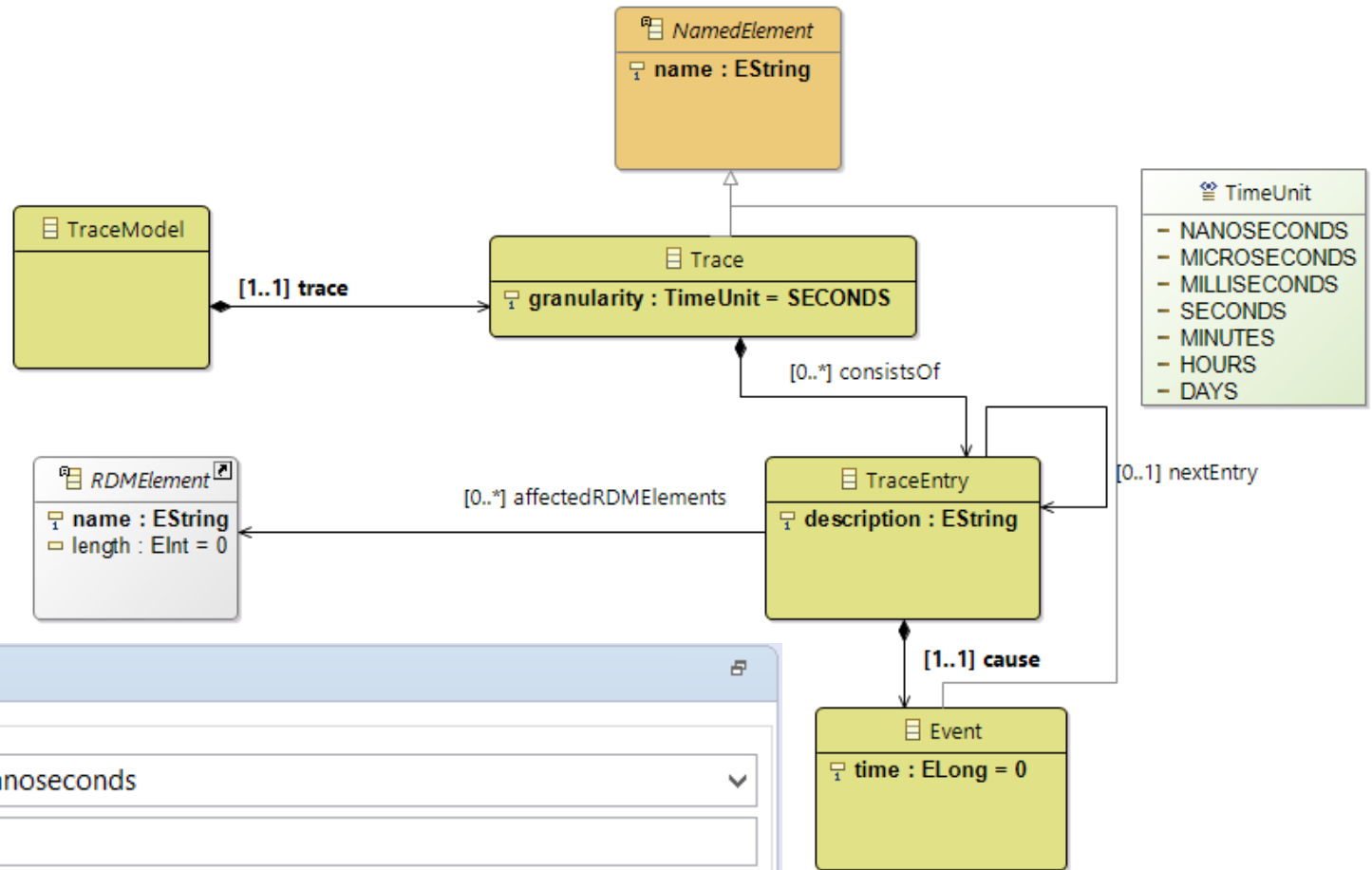
Discrete event-based simulator II.

- Behavioral model: State Machine (SM)
- Behavior of RDM elements can be specified in SM
- DESMO-J events generated from SM events:
 - TurnoutDirectionChanged (full)
 - TrainTrackElementChanged (only stubs)
- Wrapper classes generated from RDM:
 - Train
 - Section, Turnout, Station
 - Signal, TurnoutSignal
- Stubs generated for Waiting Events

Discrete event-based simulator II.

- DESMO-J simulation core generated:
 - RailwaySimulationModel (most parts)
 - SimulationRunner (full)
- Generated code can be extended with manual code and used for DESMO-J simulation! (DEMO)
- Simulated both a simple a model and the Research Group's railway track's model

Extra: Trace



Simulation Settings

Settings

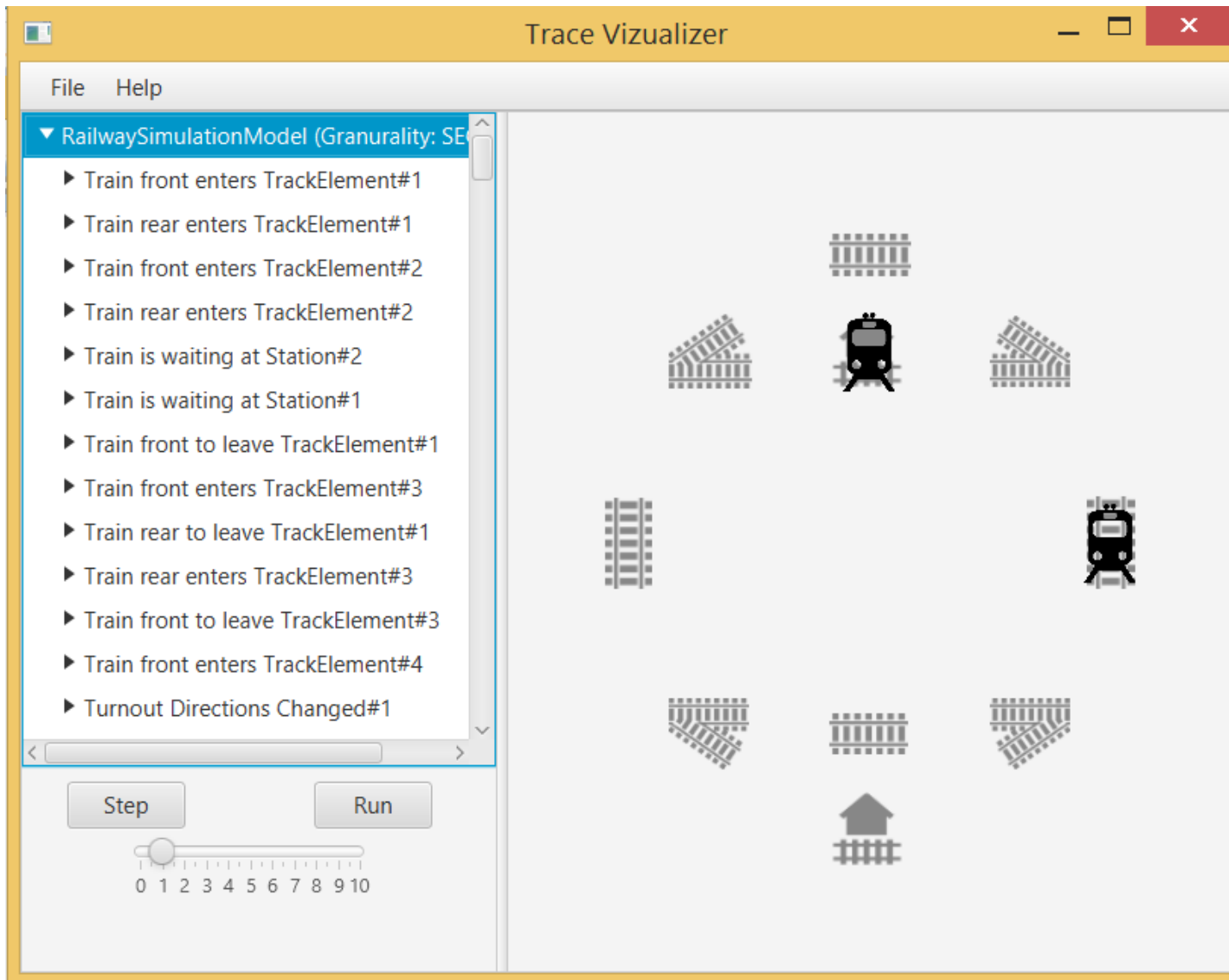
Simulation granularity Nanoseconds

Simulation duration

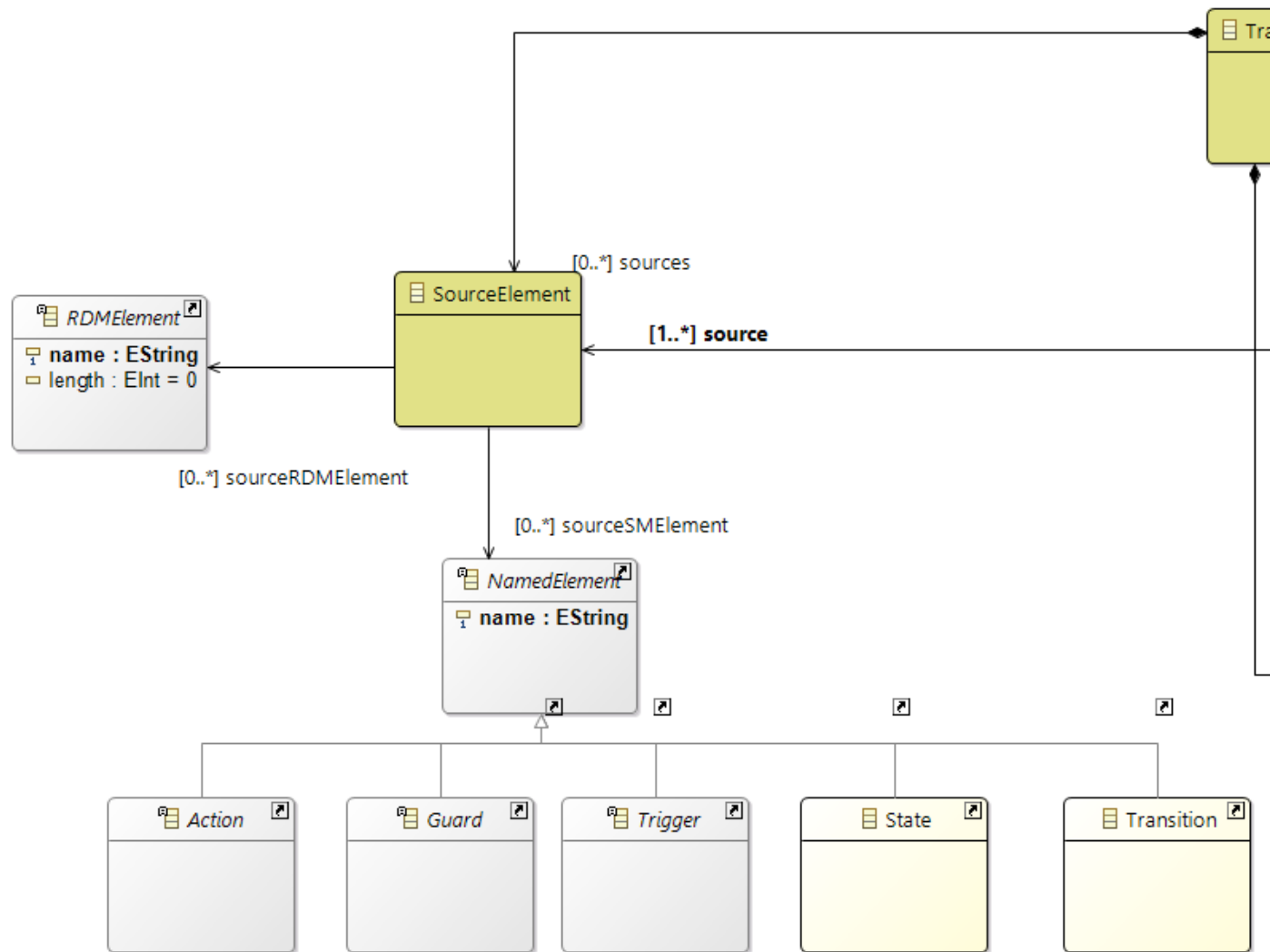
Duration granularity Nanoseconds

Save

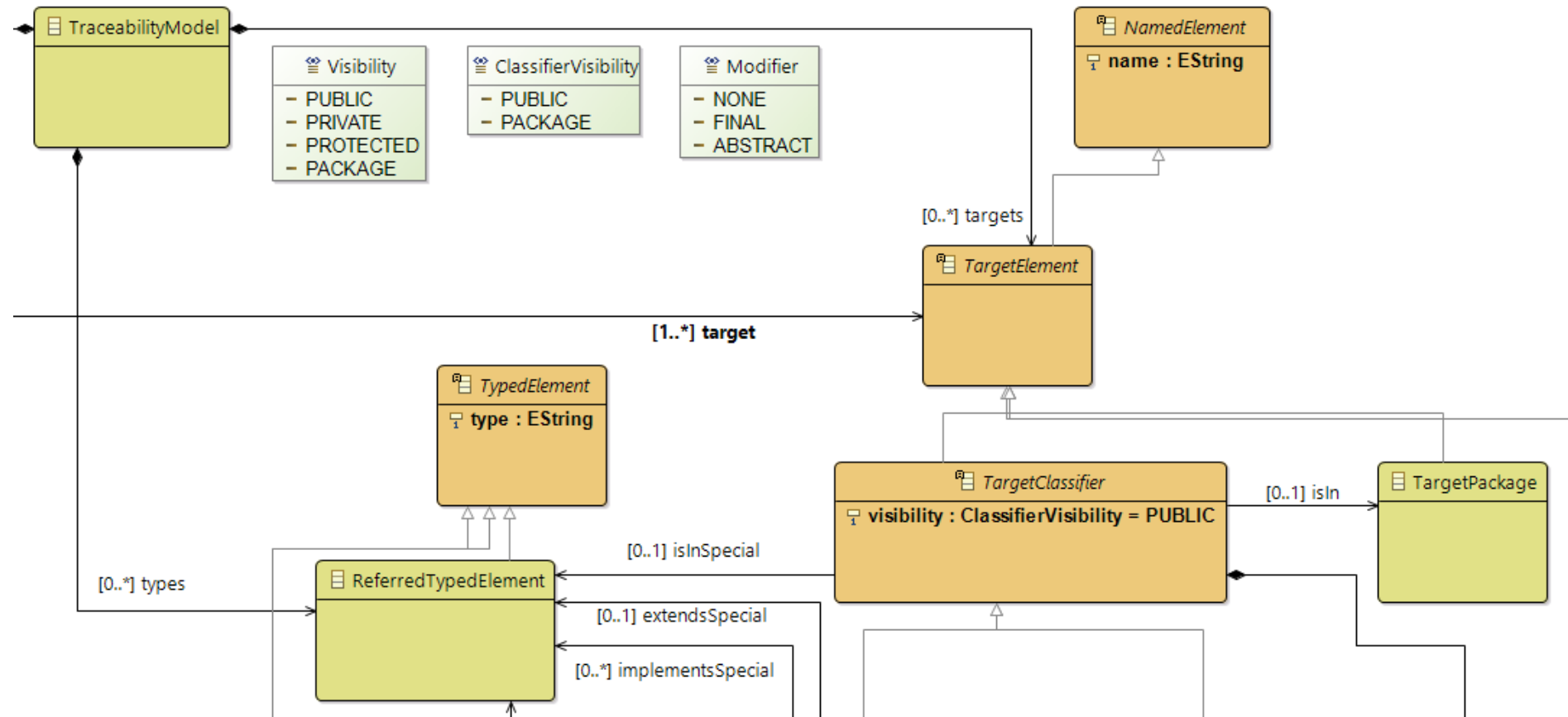
Extra: Replayable trace



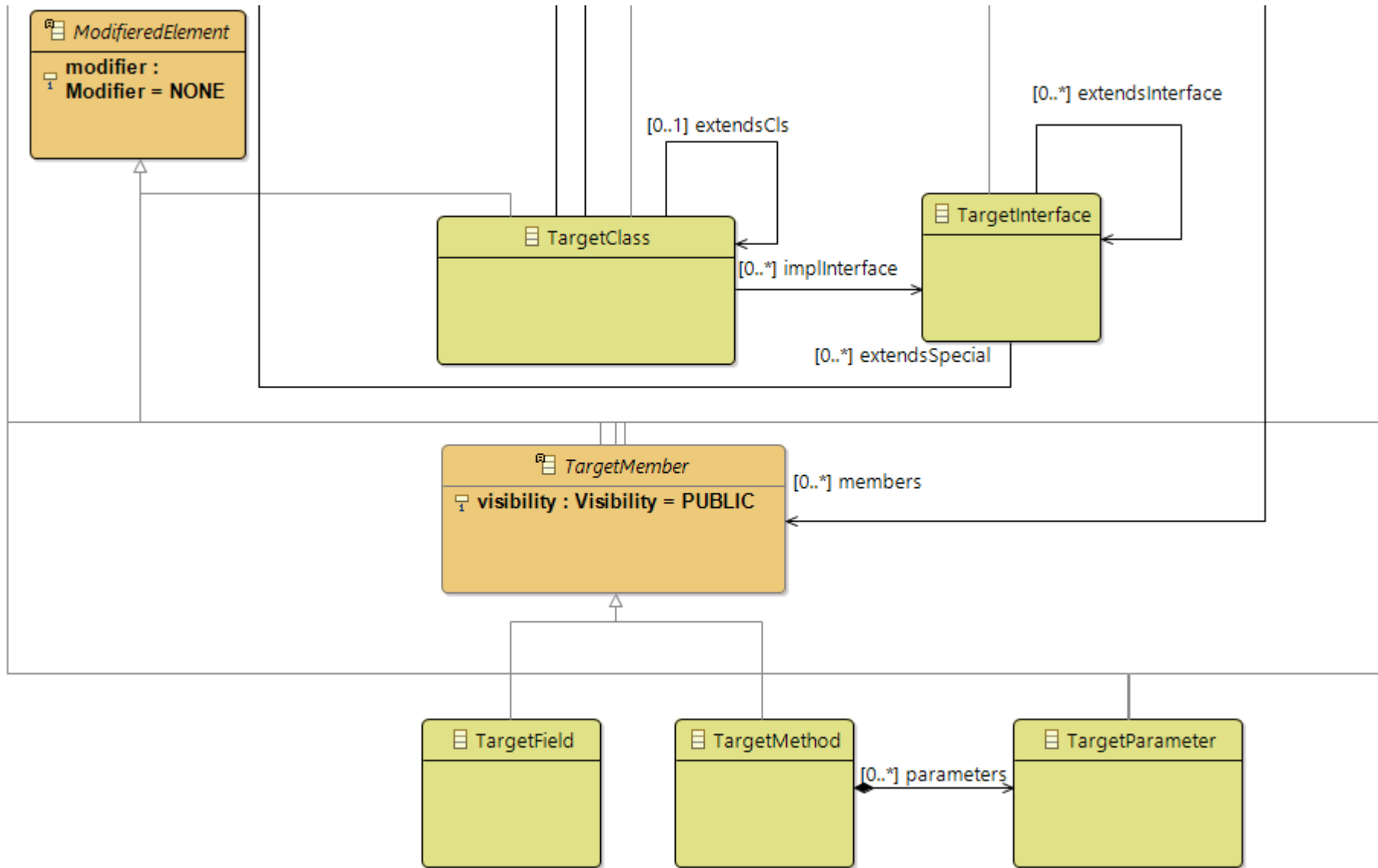
Extra: Traceability



Extra: Traceability



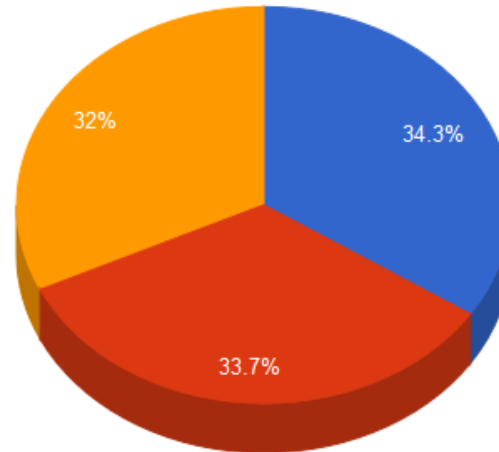
Extra: Traceability



Division of labour

			Project: Railway Domain Modeling										Project Leaders: Benedek H, Raimund K., Tamás N.										Project ID: 1			
			Project Goal: The project is a homework assignment for the MDSD course.																							
Milestones			Main Tasks										Schedule										Responsibility			
x			1	Metamodel + constraints design (stand-up meeting)										x	x	x	x							HB	KR	NT
x			2	Create structural metamodel (implementation in EMF)												x	x							HB		
x			3	Create behavioural metamodel (implementation in EMF)													x							HB		
x			4	Connect behavioural metamodel to the strutral																				HB		
x			5	Create instance model (implementation in EMF																				NT	HB	KR
x			6	Define constraints (implementation in EMF-IncG																				KR	HB	
x			7	Create presentation I																				NT	HB	KR
	x		8	Textual and graphical DSL design (stand-up me											x	x	x	x						KR	NT	HB
	x		9	Define textual modeling language (stuctural and											x	x	x	x						KR		
	x		10	Define graphical modeling language											x	x	x	x						HB	NT	
	x		11	Create instance model (textual and/or graphical													x	x						KR		
	x		12	Extra: create quality editor													x	x						HB	NT	
	x		13	Extra: model the full railway model of the resear														x						HB		
	x		14	Create presentation II														x						KR	NT	HB
		x	15	Extra: Trace, Traceability metamodel, change tl															x	x	x			HB		
		x	16	Extra: Create auto-formatter fo textual DSL																	x			KR		
		x	17	Develop a DESMO-J simulation environment (m																	x			HB		
		x	18	Create Xtend code-generator to generate a DES																	x	x		NT	KR	
		x	19	Create UI extension for code generation using J																	x	x		KR		
		x	20	Create presentation III																		x		NT	KR	HB
Assesment I																							HB	Beni		
Assesment II																							KR	Raimy		
Assesment III																							NT	Tomi		
			Beni - working hour(s)										2	3	4	8	1	0	2	0	15	2	20	4	61	
			Raimy - working hour(s)										2	2	2	8	3	0	1	2	13	0	2	25	60	
			Tomi - working hour(s)										2	2	4	7	1	0	1	5	12	0	5	18	57	
													6	7	10	23	5	0	4	7	40	2	27	47	178	

Project Overall



Beni Raimy Tomi

Q & A