



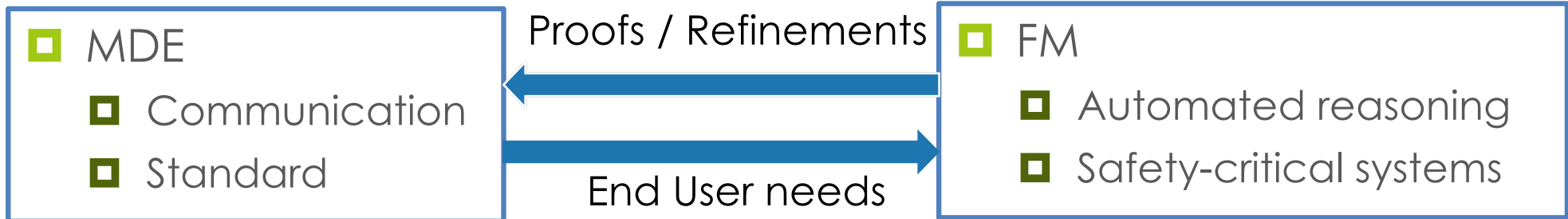
Eclipse Tools Day 2019

An Eclipse tool to mix DS(M)Ls and formal reasoning

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WithdrawMoney

Claim: If r is irrational, then \sqrt{r} is irrational.

```
rewrite;  
next;  
instantiate n2\_1 == name1;  
rewrite;
```

Z/EVES Output

Proof case #2, results for: cases

```
n1 = name1 ∧  
¬ (∃ n2: {name1} ∪ {name2} • (¬ name1 = n2))  
⇒  
(∃ NAMES: F\1\ NAME •  
(∀ n1__0: NAMES • (∃ n2__0: NAMES • ¬ n1__0 = n2__0)))
```

TEGER

- Prove
- Prove by Reduce**
- Reduce
- Rewrite
- Simplify
- Invoke
- Trivial Rewrite

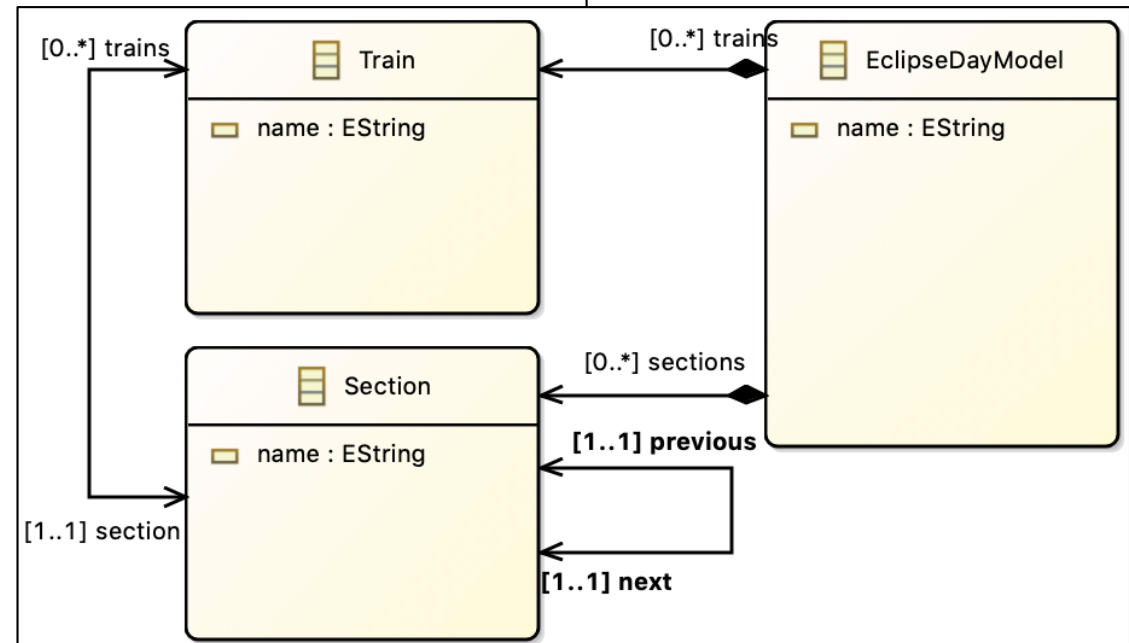
v(3) compute in v(3) . :

7, 8 4, 8

```

1 grammar org.xtext.Eclipseday
2   with org.eclipse.xtext.common.Terminals
3 generate eclipseday
4   "http://www.xtext.org/Eclipseday"
5
6 EclipseDayModel:
7   name=ID
8   (sections+=Section)*
9   (trains+=Train)*
10  ;
11
12 Section:
13   name=ID '->'
14   next=[Section] '/'
15   (trains+=[Train])* '-';
16
17 Train : name=ID;

```



- Meeduse automatically extracts a proved formal B specification from the ecore file

```
MACHINE
    eclipseday

SETS
    ECLIPSEDAYMODEL;
    SECTION;
    TRAIN

ABSTRACT_VARIABLES
    EclipseDayModel,
    Section,
    Train,
    connection,
    position,
    A_trains_eclipseDayModel,
    A_sections_eclipseDayModel

INVARIANT
    EclipseDayModel : FIN(ECLIPSEDAYMODEL) &
    Section : FIN(SECTION) &
    Train : FIN(TRAIN) &
    connection : Section >->> Section &
    position : Train --> Section &
    A_trains_eclipseDayModel : Train +-> EclipseDayModel &
    A_sections_eclipseDayModel : Section +-> EclipseDayModel
```

- Meeduse allows to integrate within the EMF package dynamic specification written in the B language

```
MACHINE
    eclipsedaymain
INCLUDES
    eclipseday
INVARIANT
    position : Train >-> Section
OPERATIONS
move(tt,ss) =
    PRE
        tt : Train &
        ss : Section &
        connection(position(tt)) = ss &
        {(tt |-> ss)} /<: position &
        ss /: ran(position)
    THEN
        Train_SetSection(tt,ss)
    END
END
```

DSL Animation

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- Given a model (written in EMF-based tools, like Xtext) Meeduse allows to animate its dynamic semantics.

The screenshot displays the Meeduse IDE interface. The main editor shows a DSL model named "MyDemo" with the following rules:

```
Section1 -> Section2 / T1 -  
Section2 -> Section3 / -  
Section3 -> Section4 / T2 -  
Section4 -> Section1 / -
```

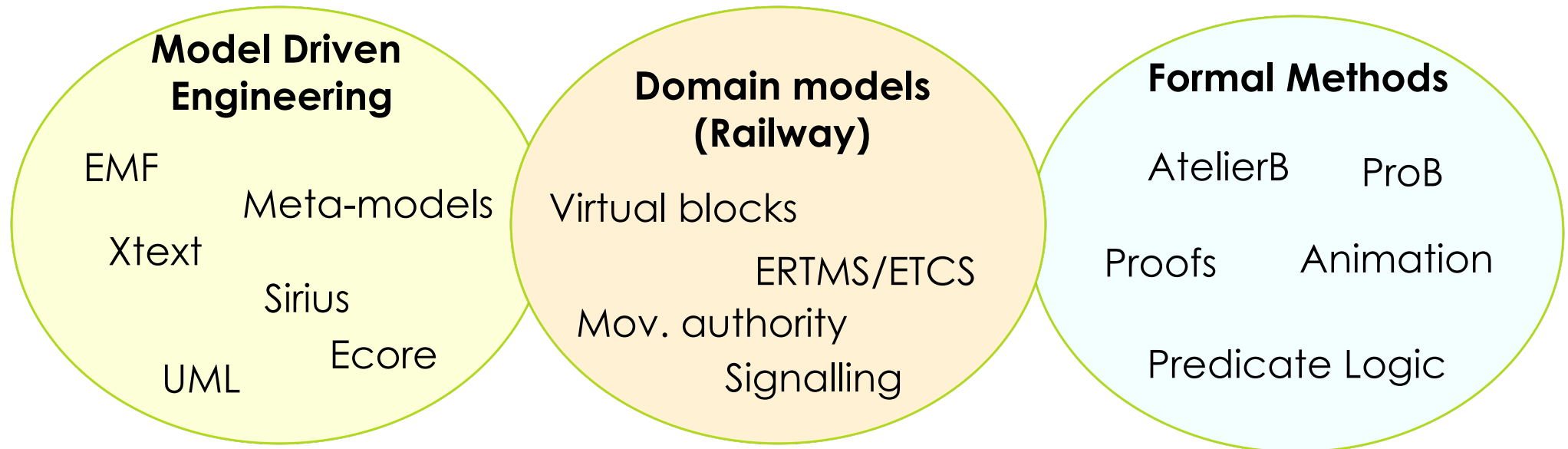
Below the DSL, the text "T1 T2" is visible. The bottom part of the editor shows a "new Representation" view with a table representing the model's state:

	Section1	Section2	Section3	Section4
T1				
T2				

The right sidebar contains two views:

- Animation view**: Shows the "Expose Operation" menu with icons for play, stop, and refresh. Below it, the operations are listed: `move[T1, Section2]` and `move[T2, Section4]`.
- Output State View**: Shows the invariant `INVARIANT = true` and the current state of the model:

```
A_sections_eclipseDayModel = {(Section  
position = {(T1->Section1),(T2->Section3  
EclipseDayModel = {MyDemo}  
connection = {(Section1->Section2),(Sec  
Train = {T1,T2}  
Section = {Section1,Section2,Section3,S  
A_trains_eclipseDayModel = {(T1->MyDer
```



- Meedsue for MDE
 - Award for **best verification**, and Third audience award in the 12th Transformation tool contest (TTC'19)
- Meeduse for Railway
 - Akram Idani, et al., Towards a Tool-Based Domain Specific Approach for Railway Systems Modeling and Validation. 3rd International conference on Reliability, Safety, and Security of Railway Systems. **RSSRail 2019**.
- Meeduse for FM
 - Akram Idani, et al., Incremental Development of a Safety Critical System Combining formal Methods and DSMLs - Application to a Railway System. 24th International Conference on Formal Methods for Industrial Critical Systems. **FMICS 2019**.