

MoSiS

Eureka Σ I 3674 Programme, ITEA2 project ip06035
SINTEF / Andreas Svendsen, 2009-04-02

Metamodel Examples (TCL & CVL)

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Overview

- Metamodeling
- Eclipse Modeling Framework (EMF)
- Graphical Modeling Framework (GMF)
- Train Control Language (TCL)
- Common Variability Language (CVL)

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Metamodeling

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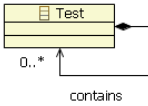



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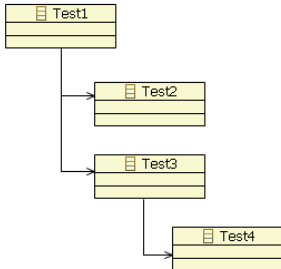
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Metamodeling



Metamodel

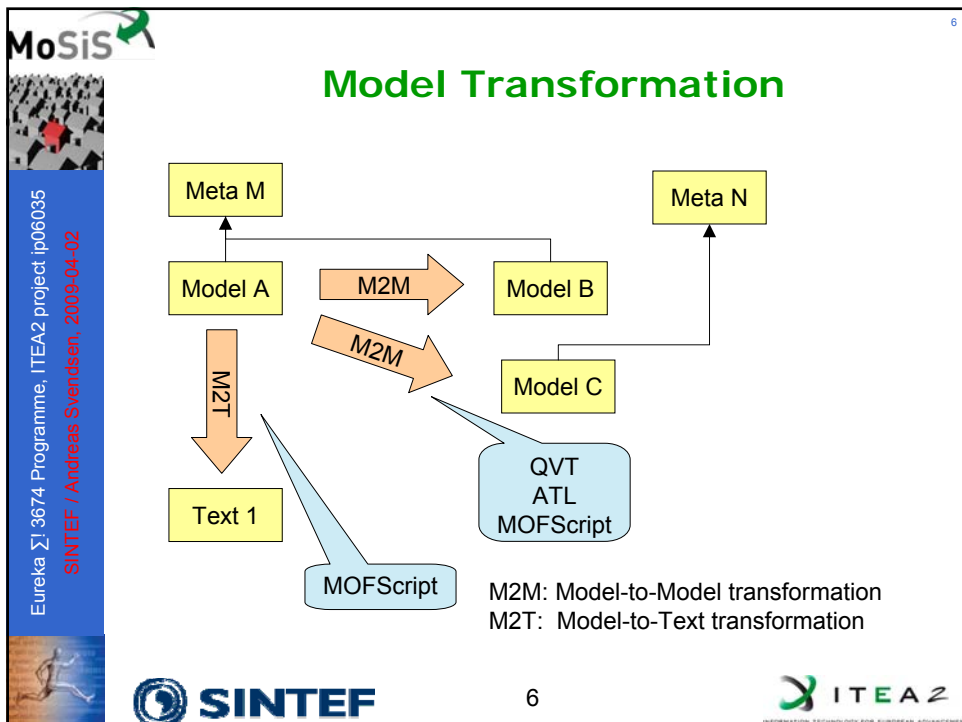
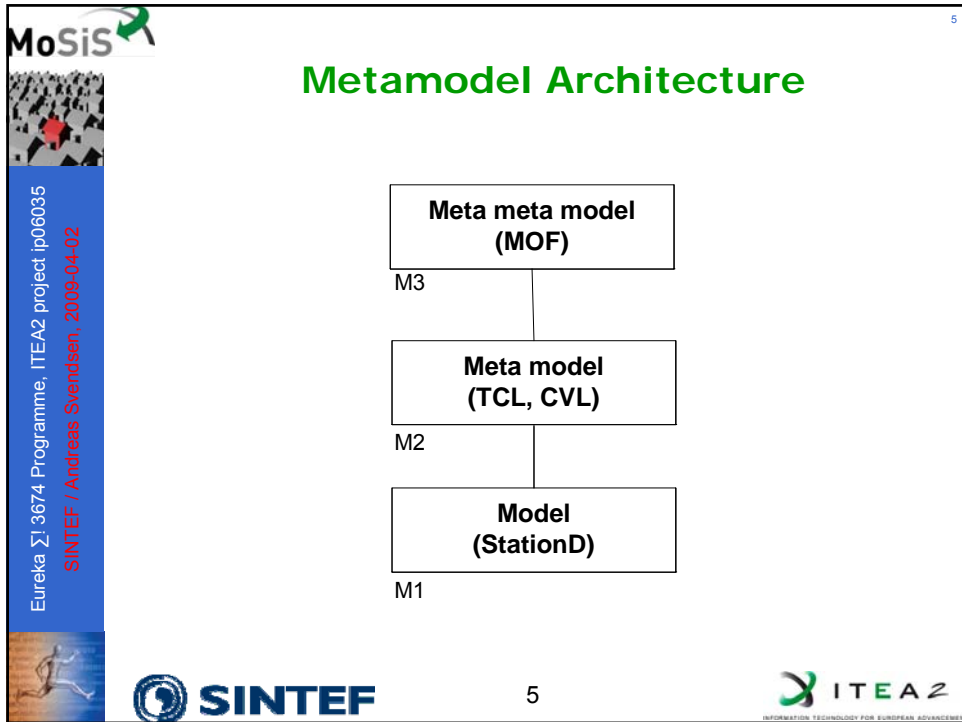


Instance of metamodel



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Eclipse Modeling Framework (EMF)

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Eclipse Modeling Framework

- **Java Framework for Eclipse**
 - Building tools based on a structured model
 - Model definition based on XMI (XML Metadata Interchange)
 - Ecore is a Java implementation of the core subset of MOF
- **Tree editor automatically generated from metamodel**
- **Java code can be added to extend or adjust the functionality**

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EMF - Tools

Ecore Model (Metamodel) → EMF Model → Editor Plugins

The screenshot shows a tree view of a class hierarchy for 'Station'. The classes listed are: Station, TrainRoute, TrackCircuit, Stiller, Building, StatBuilding -> Building, ElectricalBuilding -> Building, Track, LineSegment -> Track, Switch -> Track, Endpoint, TrackCircuitEndpoint -> Endpoint, MiddleEndpoint -> Endpoint, RemoteSwitch -> Switch, ManualSwitch -> Switch, and Signal. A context menu is open over the 'Station' class, showing options: Generate Model Code, Generate Edit Code, Generate Editor Code, Generate Test Code, **Generate All**, Open Foreign Model, Open, Open Ecore, and Open GenModel.

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Graphical Modeling Framework (GMF)

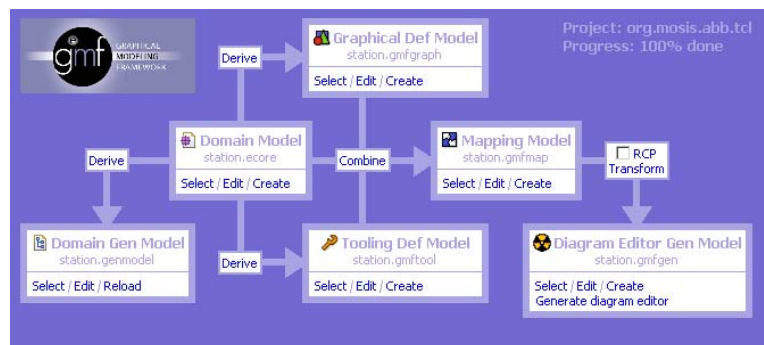
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Graphical Modeling Framework

- Framework for building graphical editors
- Basic steps to create a graphical editor
 - Design an EMF meta model
 - Create graphical representations for the elements
 - Map the elements together
 - Generate the graphical editor
 - Enhance the graphical editor by editing the generated plug-in code (Java)



GMF – Tools



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EMF/GMF - Definitions

Separate Descriptions of a Model

```
graph LR; DDM[Diagram Domain Model] -.-> DM[Domain Model]
```

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Train Control Language (TCL)

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TCL – EMF/GMF

EMF

GMF

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TCL - Tools

Code generation

Station model

Tool palette

Property view

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Station M

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A2	A21	A211	M2	G21	S211	L2	N21	P211	G2	S21	S211
M	A	1	O1	O2	O3	Z	B	L	H	Z1	

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TCL - Safety Integration

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Project Definition

Design station

Requirements and Architecture

Detailed Design

Implementation

Generate representations

Verification and Validation

Operations and Maintenance

System Verification and Validation

Integration, Test, and Verification

Project Test and Integration

Generate test cases

Time

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Common Variability Language (CVL)

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Variability Modeling

- **Create new stations based on already existing ones**
 - without increasing the complexity of TCL
- **Variation on values and structure**
 - e.g. add/remove a track
- **Define and resolve the variability using a separate variability language**

The diagram illustrates a variability modeling process. It starts with a single horizontal line representing a track. A blue arrow points downwards to a second diagram where a second track has been added, creating a double-track structure. This visualizes the concept of 'Variation on values and structure' mentioned in the text.

- Ø. Haugen et al., "Adding Standardized Variability to Domain Specific Languages", in 12th International Software Product Line Conference (SPLC). Limerick, Ireland, (2008).

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Generic 2T Station

Station 2T

BI2	BI1	L2	N1	M2	O1	AI2	AI1
L	B	01	02	A	M		

Station EL

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Station D

Station Name

Station D

TrackCircuit

BI2	BI1	L2	N1	M2	O1	AI2	AI1
L	B	01	02	A	M	Z1	

Manual Switch

Derailer

SLock

Station EL

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Station 2T -> D

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B12	B11	L2	N1	M2	O1	A12	A11
L	B	01	02	A	M		

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CVL Editor

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References

- **EMF**
 - <http://www.eclipse.org/modeling/emf/>
- **GMF**
 - <http://www.eclipse.org/modeling/gmf/>
- **MOFScript**
 - <http://www.eclipse.org/gmt/mofscript/>
- **CVL**
 - <http://www.variabilitymodeling.org/>