UML State Machine Simulation/Model Checking with Maude

Project Overview

Responsible:

- Christian Motika
- Jens Schönborn

UML State Machine Simulation and Model Checking with Maude

Topics

- Standalone UML Maude
- Overview
- Installation
- Simulating and Model Checking of UML State Machines
- Links

Standalone UML Maude

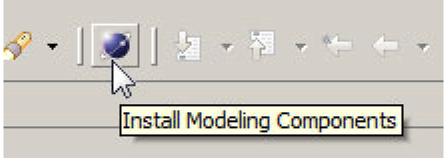
You can download a standalone version of the UML Maude implementation here: UML_SM_Maude.zip

Overview

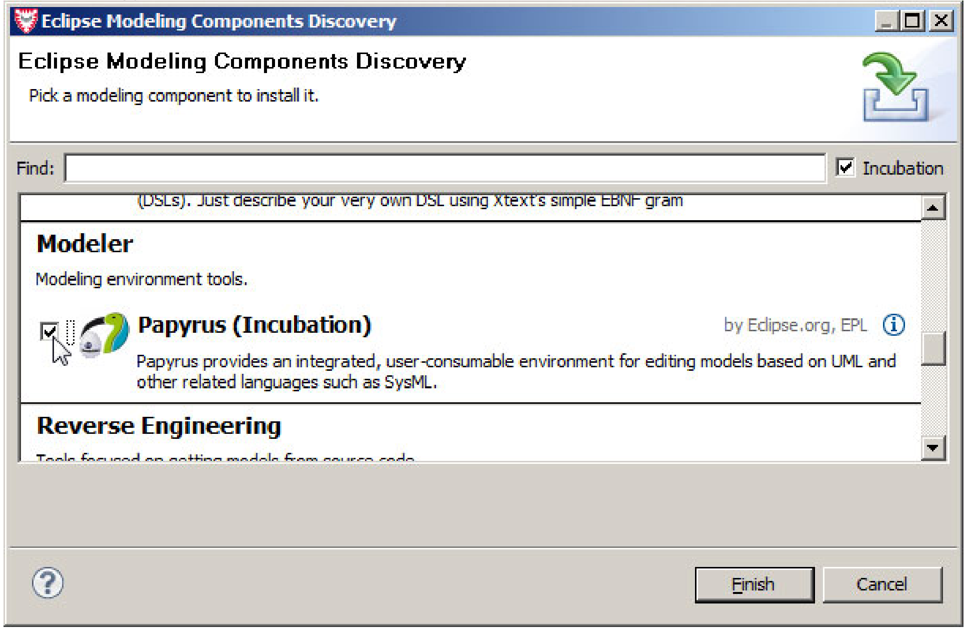
This subproject integrates the Papyrus MDT UML State Machine editor into KIELER. It also integrates the Maude System into Eclipse/KIELER and additionally uses KIELER technologies and a special generic Maude state machine backend to offer simulation and model checking based on state machines modeled in Papyrus. The editor, the DataTable and KIEM are used as a GUI and I/O facility for modeling, simulating and model checking.

Installation

1. Download and install the Maude System
2. Download and unpack the KIELER Rich Client Applications nightly builds
3. Install Papyrus
   - Start the KIELER RCA and klick on the *Install Modeling Components* button



- Select the Papyrus MDT Tools and install them into the KIELER RCA



Eclipse Modeling Components Discovery

Eclipse Modeling Components Discovery

Pick a modeling component to install it.

Find: ☑ Incubation

(DSLs). Just describe your very own DSL using Xtext's simple EBNF gram

Modeler

Modeling environment tools.

☑ **Papyrus (Incubation)** by Eclipse.org, EPL

Papyrus provides an integrated, user-consumable environment for editing models based on UML and other related languages such as SysML.

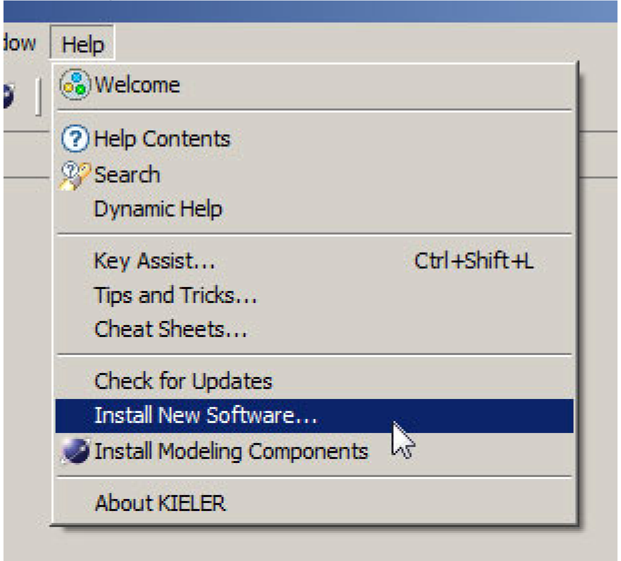
Reverse Engineering

Tools focused on getting models from source code

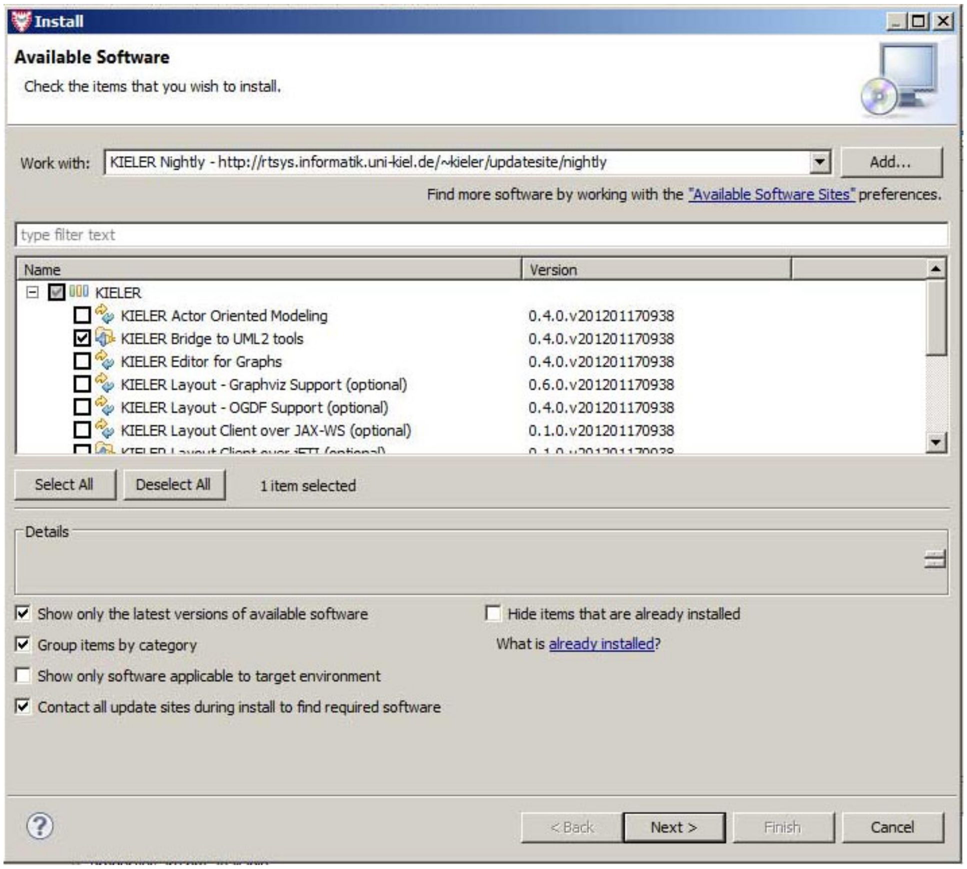
- Eclipse should now ask you to restart the KIELER RCA. Click the *Restart Now* button.

4. Finally, install KIELER UML Simulation and Model Checking components

- Click on *Help/Install New Software...*.



- Choose the *KIELER nightly - http://rtsys.informatik.uni-kiel.de/~kieler/updatesite/nightly* Update Site from the drop down list.
- Select the *KIELER Bridge to Papyrus and UML Simulation* feature and continue installation with *Next*. If that does not work you might have an older version of the nightly build and you should select the whole [x] KIELER category for installation/update.



Available Software

Check the items that you wish to install.

Work with: KIELER Nightly - http://rtsys.informatik.uni-kiel.de/~kieler/updatesite/nightly

Find more software by working with the "Available Software Sites" preferences.

type filter text

Name	Version
⊟ ▣ KIELER	
□ KIELER Actor Oriented Modeling	0.4.0.v201201170938
☑ KIELER Bridge to UML2 tools	0.4.0.v201201170938
□ KIELER Editor for Graphs	0.4.0.v201201170938
□ KIELER Layout - Graphviz Support (optional)	0.6.0.v201201170938
□ KIELER Layout - OGDF Support (optional)	0.4.0.v201201170938
□ KIELER Layout Client over JAX-WS (optional)	0.1.0.v201201170938
□ KIELER Layout Client over iETI (optional)	0.1.0.v201201170938

1 item selected

Details

☑ Show only the latest versions of available software

☑ Group items by category

□ Show only software applicable to target environment

☑ Contact all update sites during install to find required software

□ Hide items that are already installed

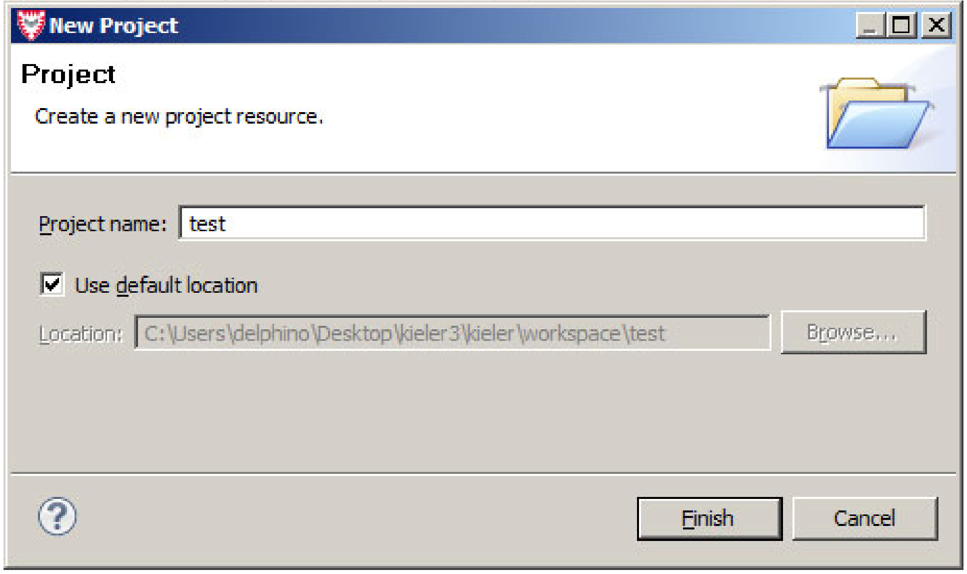
What is already installed?

- Eclipse should again ask you to restart the KIELER RCA. Click the *Restart Now* button.

5. Congratulations! You have now installed everything you need to simulate and model check UML state machines with KIELER.

Simulating and Model Checking of UML State Machines

1. Close the *Outline* Eclipse View because it may produce errors with this early version of Papyrus MDT.
2. Create an empty (normal) Eclipse Project (*File*/*New*/*Project*) and give it some name, e.g., *test*.



Project

Create a new project resource.

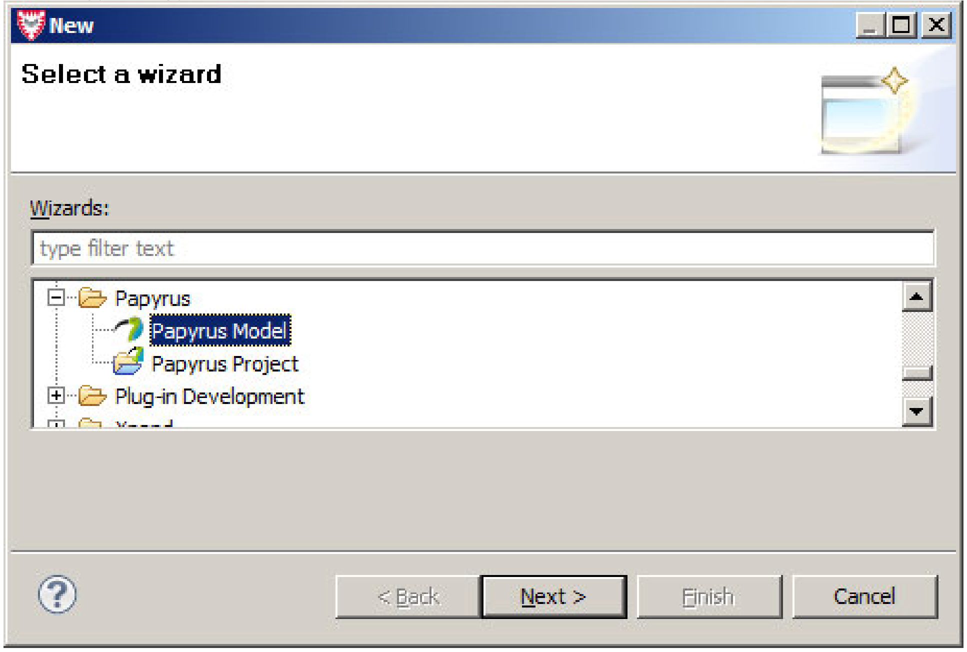
Project name: test

☑ Use default location

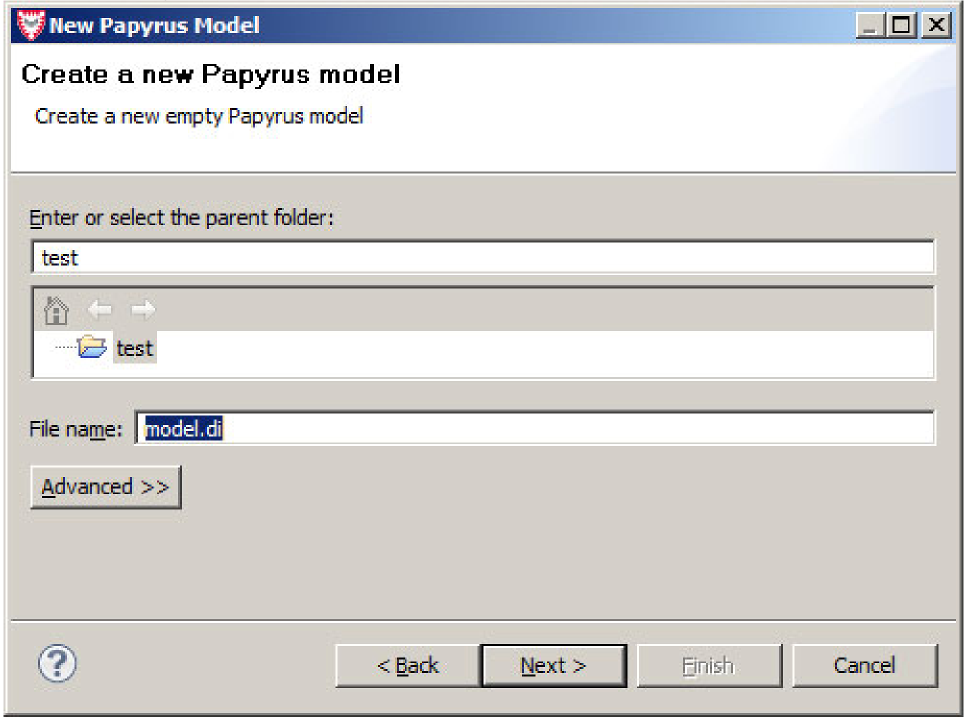
Location: C:\Users\delphino\Desktop\kieler3\kieler\workspace\test

3. Create a Papyrus Diagram in this new project:
   - *File*/*New*/*Other*

- Select *Papyrus/Papyrus Model*



- Give it a name, e.g., *model.di*.

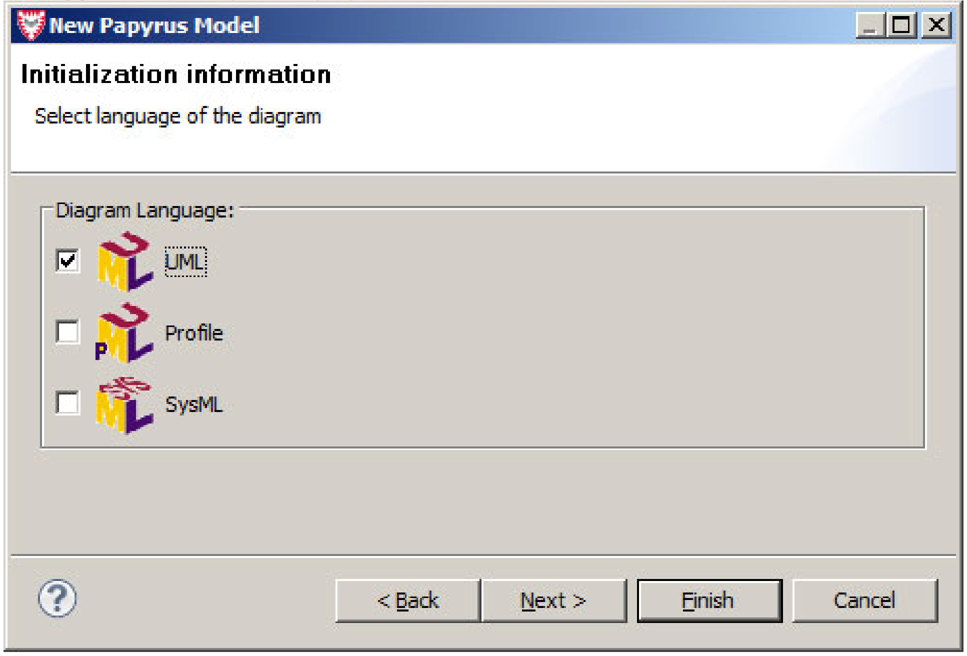


Create a new empty Papyrus model

Enter or select the parent folder: test

File name: model.di

- Select [x] UML as the *Diagram Language*.



New Papyrus Model

Initialization information

Select language of the diagram

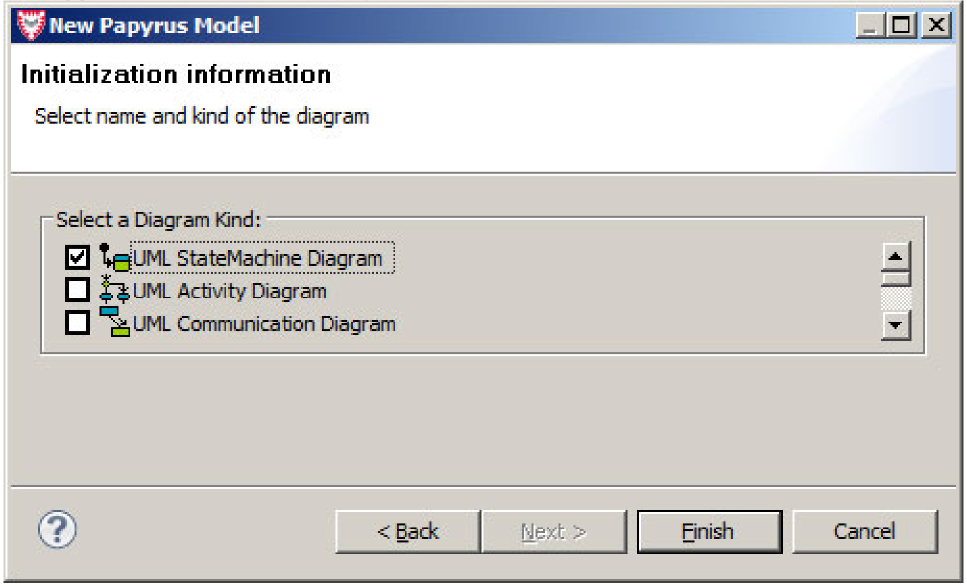
Diagram Language:

☑ UML

☐ Profile

☐ SysML

- Select [x] UML State Machine as the *Diagram Kind*.



New Papyrus Model

Initialization information

Select name and kind of the diagram

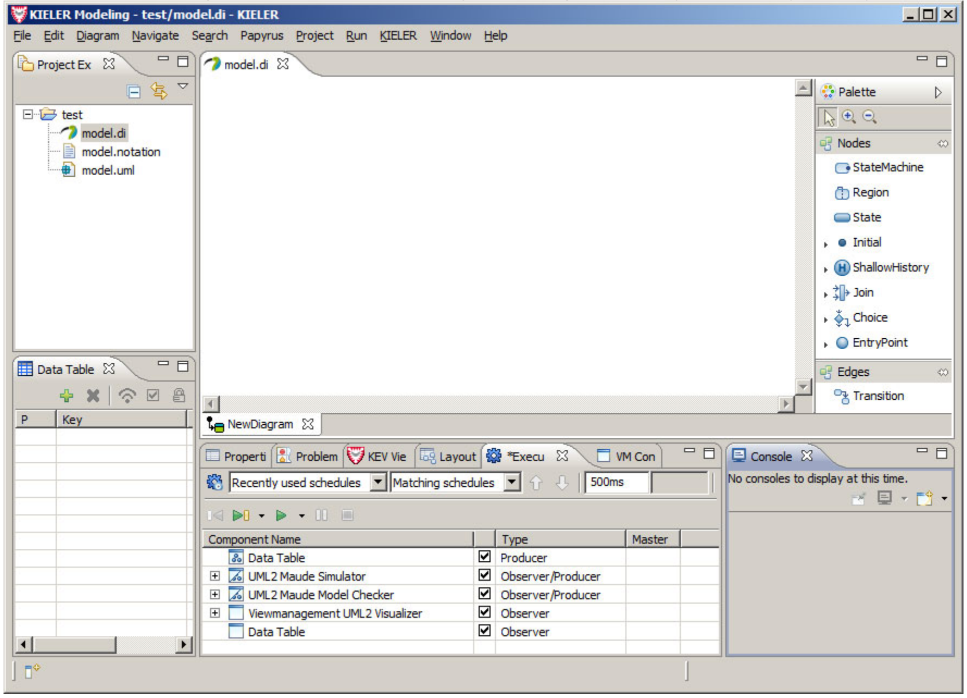
Select a Diagram Kind:

☑ UML StateMachine Diagram

☐ UML Activity Diagram

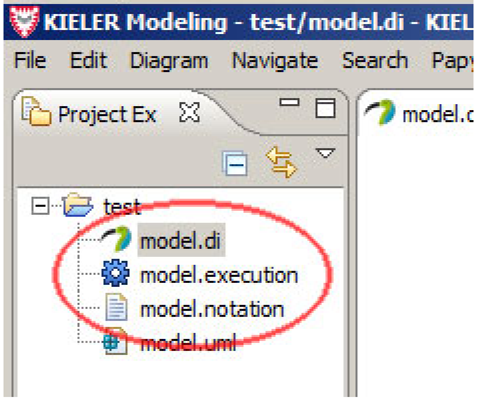
☐ UML Communication Diagram

4. You should now see a plain UML state machine diagram editor pane where you can freely model your state machine.

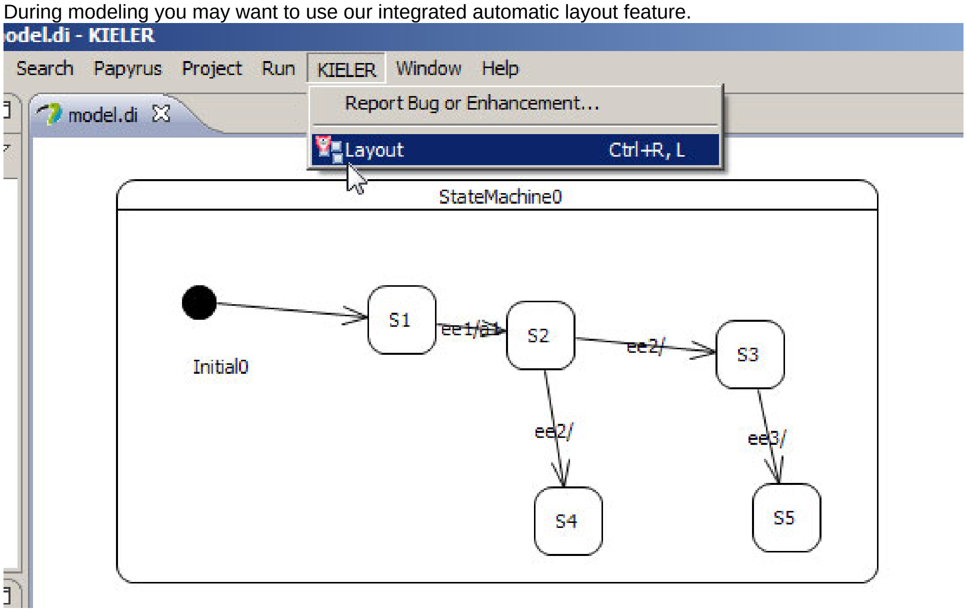


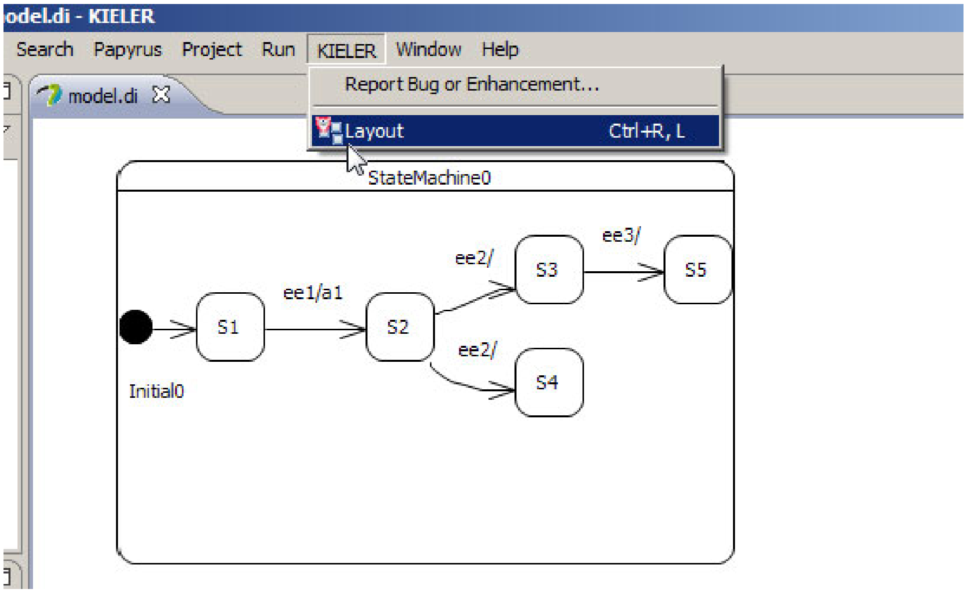
Component Name		Type	Master
Data Table	☑	Producer	
UML2 Maude Simulator	☑	Observer/Producer	
UML2 Maude Model Checker	☑	Observer/Producer	
Viewmanagement UML2 Visualizer	☑	Observer	
Data Table	☑	Observer	

5. For simulation and model checking you should modify the DataComponents in the *Execution Manager* View as seen on the above screen shot. You can simply remove the other components. While in the *Execution Manger* View you can press the *Save* button to save this setting for later usage in your project's folder. Give it some name, e.g., *model.execution*.


KIELER Modeling - test/model.di - KIEL
File Edit Diagram Navigate Search Papy
Project Ex
model.c
test
model.di
model.execution
model.notation
model.uml

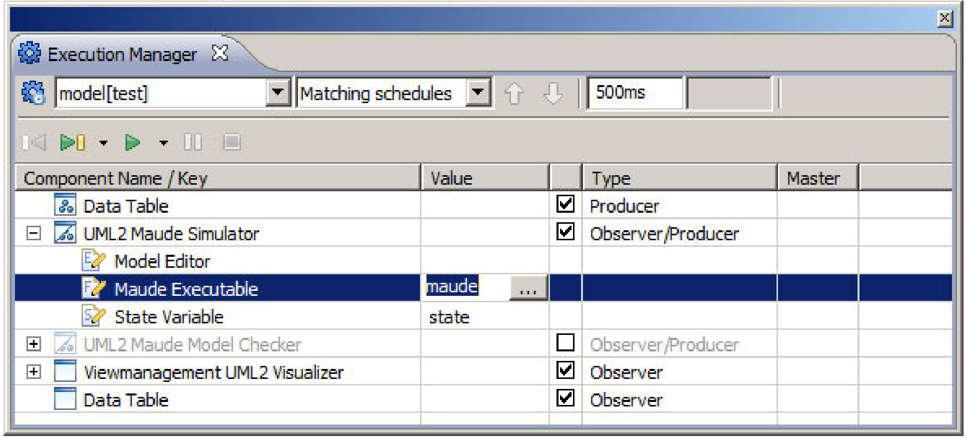
6. During modeling you may want to use our integrated automatic layout feature.





Simulating

1. Deactivate the DataComponent for model checking as shown below and validate that the path to the Maude executable is set correctly.



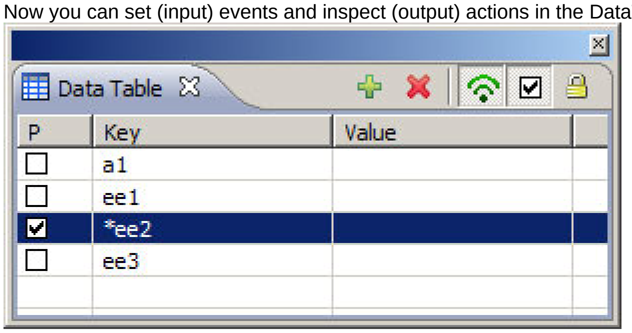
model[test] | Matching schedules | 500ms

Component Name / Key	Value		Type	Master
Data Table		☑	Producer	
⊟ UML2 Maude Simulator		☑	Observer/Producer	
Model Editor				
Maude Executable	maude ...			
State Variable	state			
⊞ UML2 Maude Model Checker		□	Observer/Producer	
⊞ Viewmanagement UML2 Visualizer		☑	Observer	
Data Table		☑	Observer	

2. You must save your changes to the diagram before you can simulate it.

3. You may want to inspect the output of Maude in the *Console* Eclipse View.

4. Start the simulation by pressing the *Step* or *Run* button of the *Execution Manager* View.
5. The state machine's Maude representation will be generated in your projects folder.
6. Now you can set (input) events and inspect (output) actions in the DataTable Eclipse View.

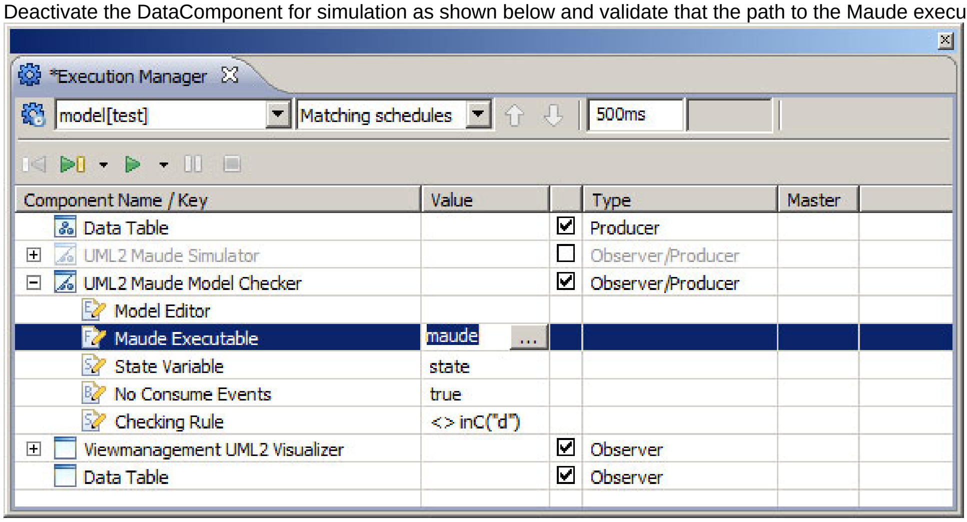


P	Key	Value
☐	a1	
☐	ee1	
☑	*ee2	
☐	ee3	

7. You can now you the *Step* button to perform a simulation (run-to-completion) step or use the *Run*/*Pause* buttons.

Model Checking

1. Deactivate the DataComponent for simulation as shown below and validate that the path to the Maude executable is set correctly.



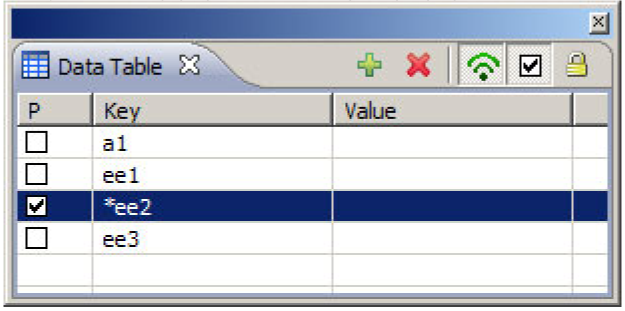
model[test] | Matching schedules | 500ms

Component Name / Key	Value		Type	Master
Data Table		☑	Producer	
UML2 Maude Simulator		☐	Observer/Producer	
UML2 Maude Model Checker		☑	Observer/Producer	
Model Editor				
Maude Executable	maude ...			
State Variable	state			
No Consume Events	true			
Checking Rule	<> inC("d")			
Viewmanagement UML2 Visualizer		☑	Observer	
Data Table		☑	Observer	

2. Set your desired model checking term in the properties of the model check DataComponent.
3. You must save your changes to the diagram before you can model check it.

4. You may want to inspect the output of Maude in the *Console* Eclipse View.

5. Start the simulation by pressing the *Step* button of the *Execution Manager* View.
6. The state machine's Maude representation will be generated in your projects folder.
7. Now you can set (input) events and inspect (output) actions in the DataTable Eclipse View.



P	Key	Value
☐	a1	
☐	ee1	
☑	*ee2	
☐	ee3	

8. When you now click on *Step* again, model checking will be performed and you will be prompted the result.

9. If there is a counter example, then you can now use subsequent clicks on *Step* to inspect it.

Links

- Papyrus MDT Eclipse Project
- The Maude System
- KIELER Execution Manager
- KIELER DataTable