Statecharts - Tool

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Agenda

- Introduction
- Installing
- Modeling
- Simulation
- Practice

Yakindu Statecharts Tool

"The free to use, open source toolkit ***YAKINDU Statechart Tools*** *(SCT) provides an integrated modeling environment for the specification and development of reactive, event-driven systems based on the concept of statecharts."*

at http://statecharts.org

Features

□ Modeling

□ Syntax checking

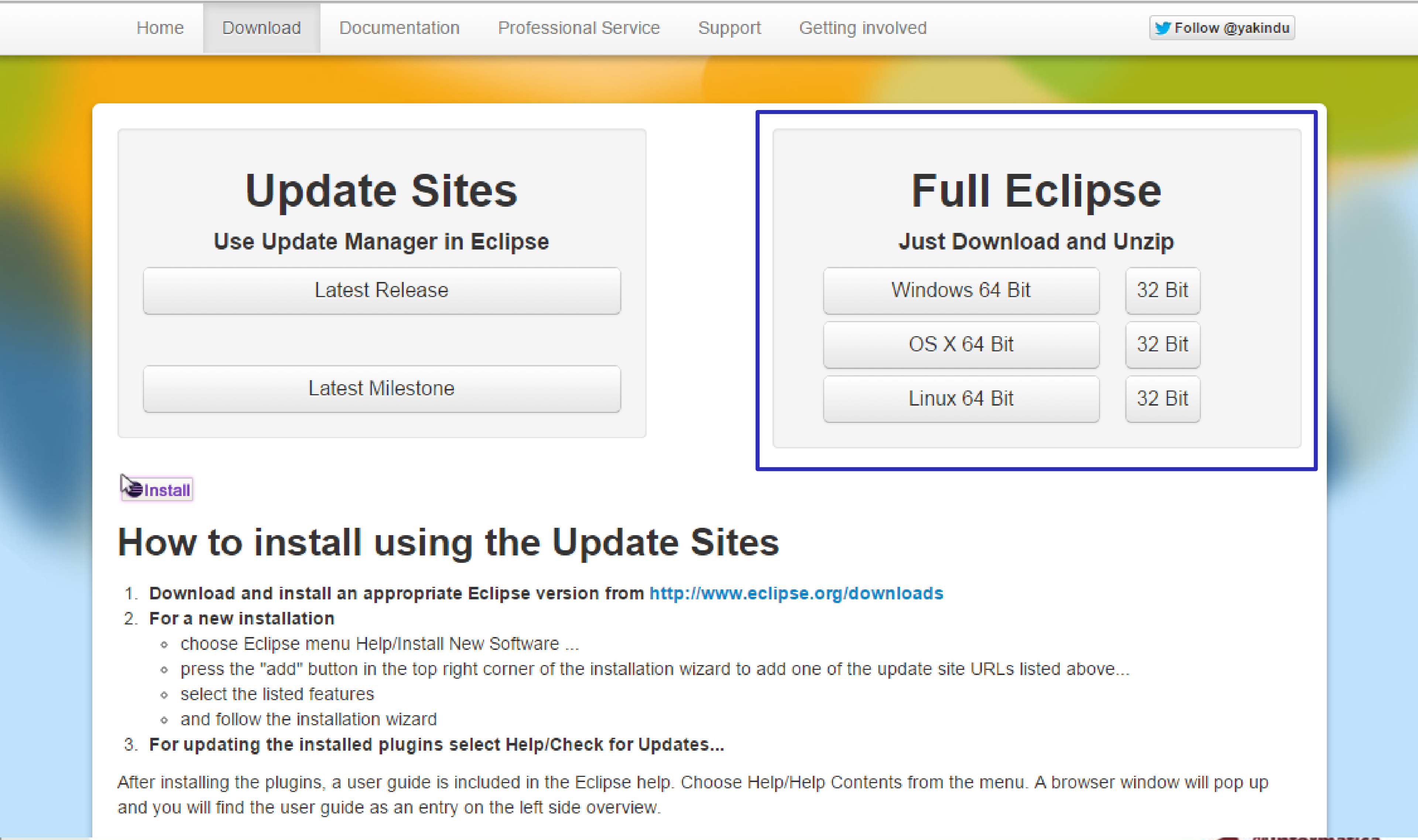
□ Simulation

□ Integration with Java code

□ Code generation

  - Java
  - C
  - C++

Download



Update Sites

Use Update Manager in Eclipse

Full Eclipse

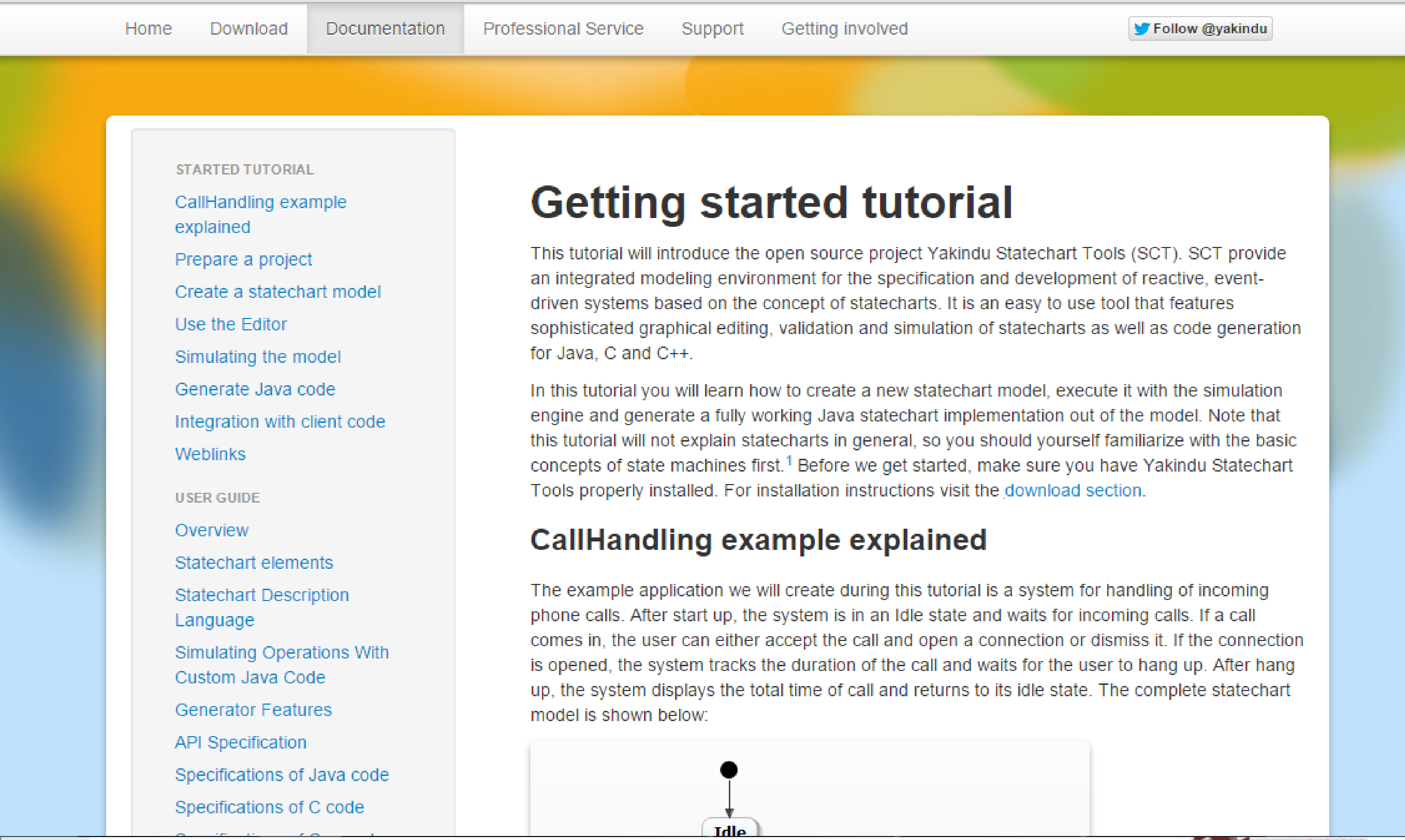
Just Download and Unzip

How to install using the Update Sites

1. **Download and install an appropriate Eclipse version from http://www.eclipse.org/downloads**
2. **For a new installation**
   - choose Eclipse menu Help/Install New Software ...
   - press the "add" button in the top right corner of the installation wizard to add one of the update site URLs listed above...
   - select the listed features
   - and follow the installation wizard
3. **For updating the installed plugins select Help/Check for Updates...**

After installing the plugins, a user guide is included in the Eclipse help. Choose Help/Help Contents from the menu. A browser window will pop up and you will find the user guide as an entry on the left side overview.

Online resources - documentation



STARTED TUTORIAL

- CallHandling example explained
- Prepare a project
- Create a statechart model
- Use the Editor
- Simulating the model
- Generate Java code
- Integration with client code
- Weblinks

USER GUIDE

- Overview
- Statechart elements
- Statechart Description Language
- Simulating Operations With Custom Java Code
- Generator Features
- API Specification
- Specifications of Java code
- Specifications of C code

Getting started tutorial

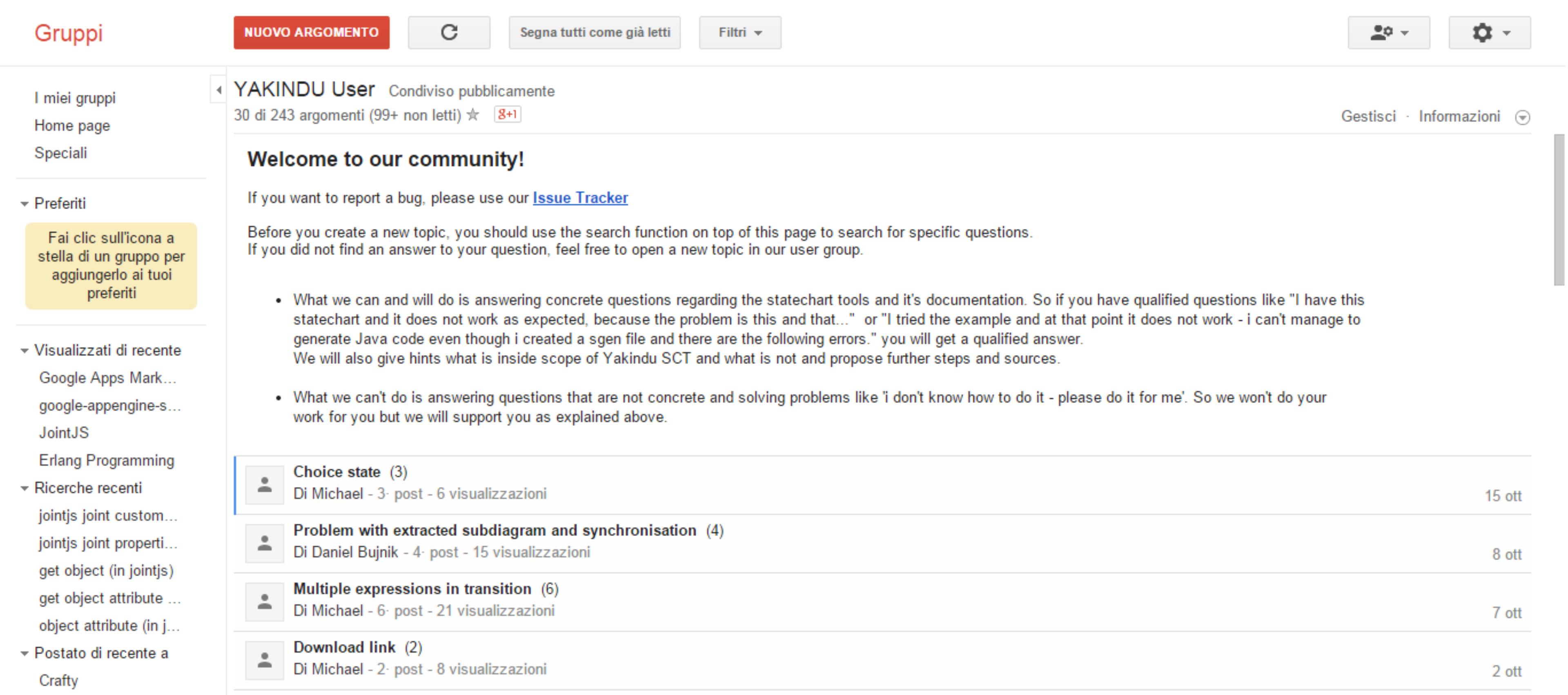
This tutorial will introduce the open source project Yakindu Statechart Tools (SCT). SCT provide an integrated modeling environment for the specification and development of reactive, event-driven systems based on the concept of statecharts. It is an easy to use tool that features sophisticated graphical editing, validation and simulation of statecharts as well as code generation for Java, C and C++.

In this tutorial you will learn how to create a new statechart model, execute it with the simulation engine and generate a fully working Java statechart implementation out of the model. Note that this tutorial will not explain statecharts in general, so you should yourself familiarize with the basic concepts of state machines first.[1] Before we get started, make sure you have Yakindu Statechart Tools properly installed. For installation instructions visit the download section.

CallHandling example explained

The example application we will create during this tutorial is a system for handling of incoming phone calls. After start up, the system is in an Idle state and waits for incoming calls. If a call comes in, the user can either accept the call and open a connection or dismiss it. If the connection is opened, the system tracks the duration of the call and waits for the user to hang up. After hang up, the system displays the total time of call and returns to its idle state. The complete statechart model is shown below:

Online resources - forum



Fai clic sull'icona a stella di un gruppo per aggiungerlo ai tuoi preferiti

YAKINDU User Condiviso pubblicamente

30 di 243 argomenti (99+ non letti) ☆ 8+1

Welcome to our community!

If you want to report a bug, please use our Issue Tracker

Before you create a new topic, you should use the search function on top of this page to search for specific questions.
If you did not find an answer to your question, feel free to open a new topic in our user group.

- What we can and will do is answering concrete questions regarding the statechart tools and it's documentation. So if you have qualified questions like "I have this statechart and it does not work as expected, because the problem is this and that..." or "I tried the example and at that point it does not work - i can't manage to generate Java code even though i created a sgen file and there are the following errors." you will get a qualified answer.
  We will also give hints what is inside scope of Yakindu SCT and what is not and propose further steps and sources.
- What we can't do is answering questions that are not concrete and solving problems like 'i don't know how to do it - please do it for me'. So we won't do your work for you but we will support you as explained above.

Choice state (3)
Di Michael - 3 post - 6 visualizzazioni — 15 ott

Problem with extracted subdiagram and synchronisation (4)
Di Daniel Bujnik - 4 post - 15 visualizzazioni — 8 ott

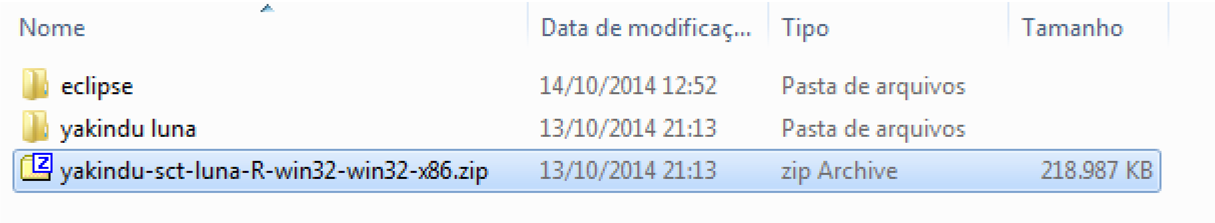
Multiple expressions in transition (6)
Di Michael - 6 post - 21 visualizzazioni — 7 ott

Download link (2)
Di Michael - 2 post - 8 visualizzazioni — 2 ott

Yakindu –
installing & Running

Installing

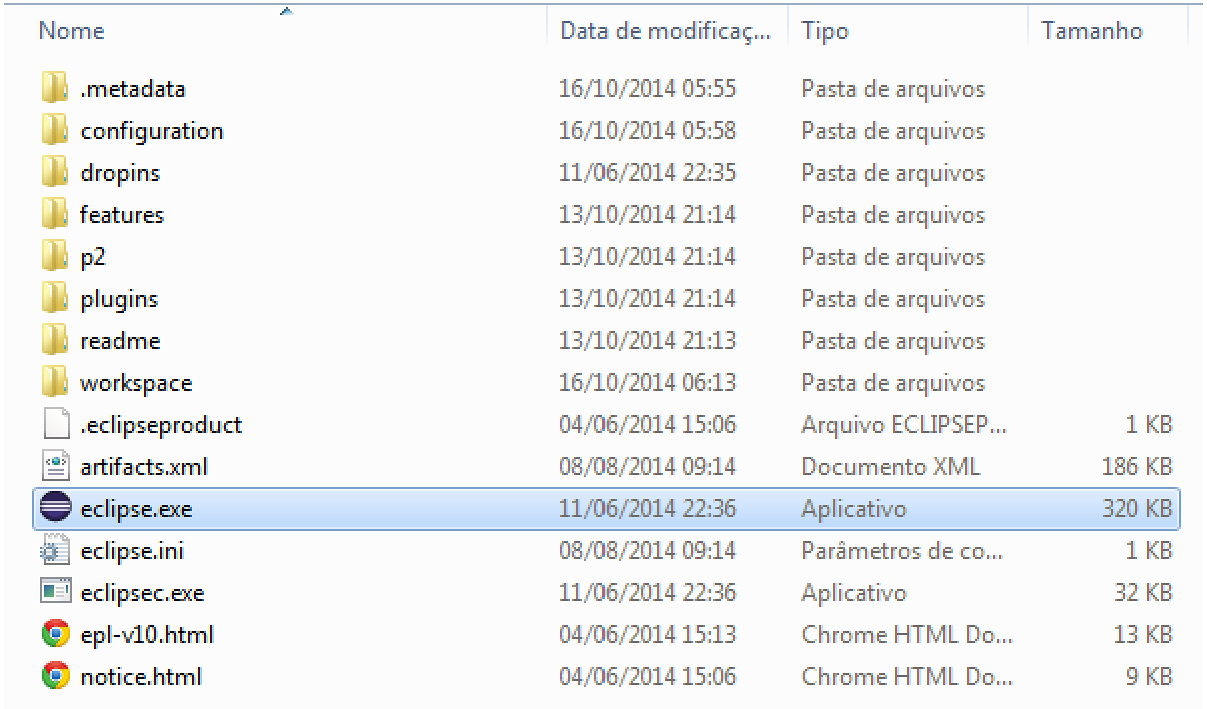
If you get the “Full Eclipse” version, all you need to do is to extract the downloaded file



Nome	Data de modificaç...	Tipo	Tamanho
eclipse	14/10/2014 12:52	Pasta de arquivos	
yakindu luna	13/10/2014 21:13	Pasta de arquivos	
yakindu-sct-luna-R-win32-win32-x86.zip	13/10/2014 21:13	zip Archive	218.987 KB

Running (1/3)

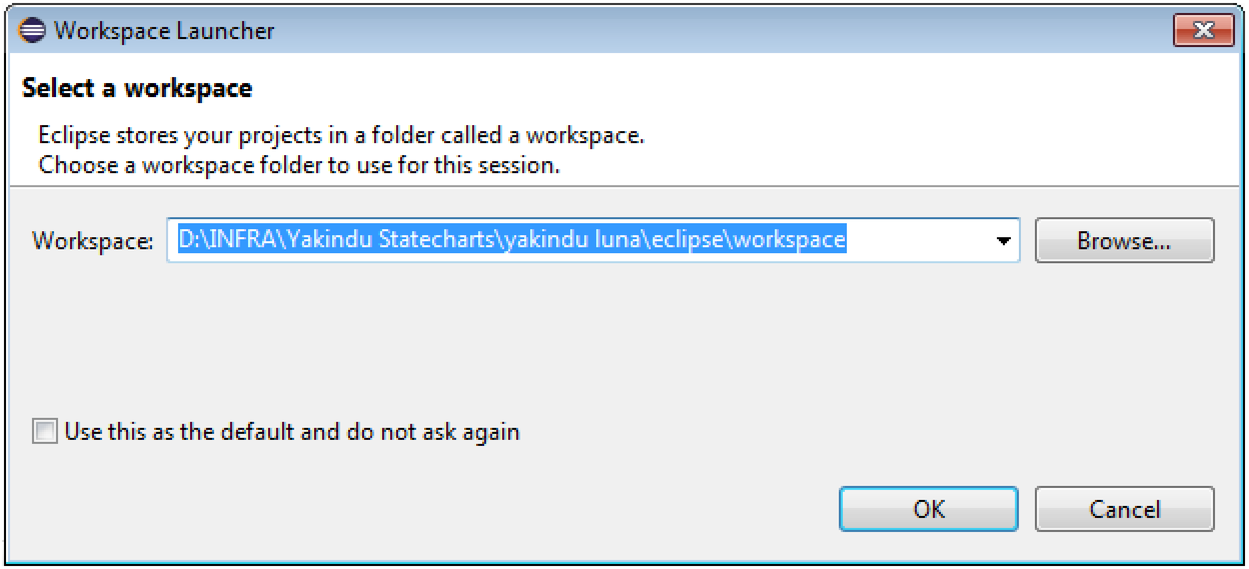
And then just run the Eclipse execution file from the folder you’ve just extracted



Nome	Data de modificaç...	Tipo	Tamanho
.metadata	16/10/2014 05:55	Pasta de arquivos	
configuration	16/10/2014 05:58	Pasta de arquivos	
dropins	11/06/2014 22:35	Pasta de arquivos	
features	13/10/2014 21:14	Pasta de arquivos	
p2	13/10/2014 21:14	Pasta de arquivos	
plugins	13/10/2014 21:14	Pasta de arquivos	
readme	13/10/2014 21:13	Pasta de arquivos	
workspace	16/10/2014 06:13	Pasta de arquivos	
.eclipseproduct	04/06/2014 15:06	Arquivo ECLIPSEP...	1 KB
artifacts.xml	08/08/2014 09:14	Documento XML	186 KB
eclipse.exe	11/06/2014 22:36	Aplicativo	320 KB
eclipse.ini	08/08/2014 09:14	Parâmetros de co...	1 KB
eclipsec.exe	11/06/2014 22:36	Aplicativo	32 KB
epl-v10.html	04/06/2014 15:13	Chrome HTML Do...	13 KB
notice.html	04/06/2014 15:06	Chrome HTML Do...	9 KB

Running (2/3)

During startup you'll be prompted with the usual "Select a worspace" window



Select a workspace

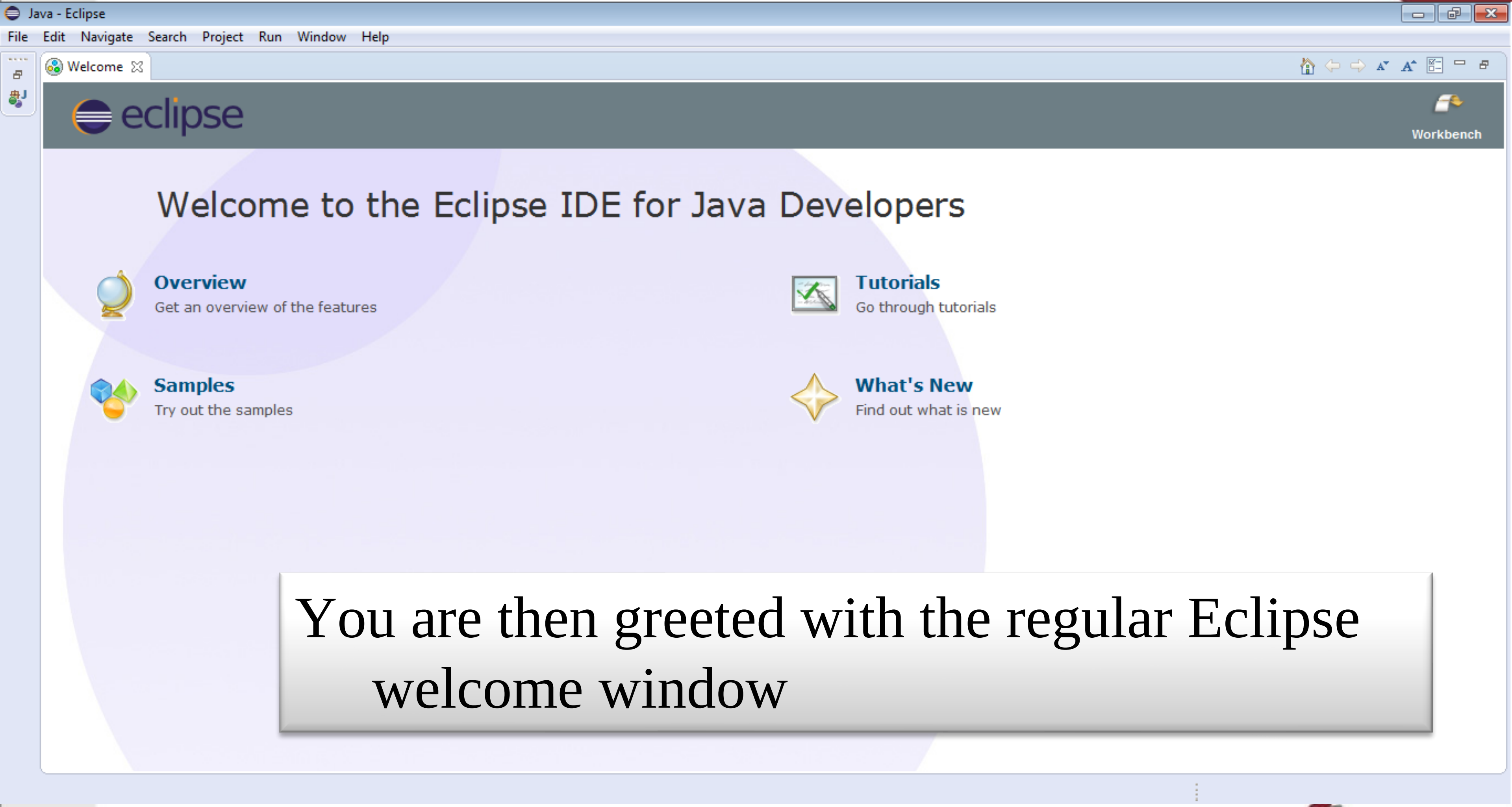
Eclipse stores your projects in a folder called a workspace.
Choose a workspace folder to use for this session.

Workspace: D:\INFRA\Yakindu Statecharts\yakindu luna\eclipse\workspace

□ Use this as the default and do not ask again

You can choose any folder to store your projects' files, then press "OK"

Running (3/3)



Welcome to the Eclipse IDE for Java Developers

Overview Get an overview of the features

Tutorials Go through tutorials

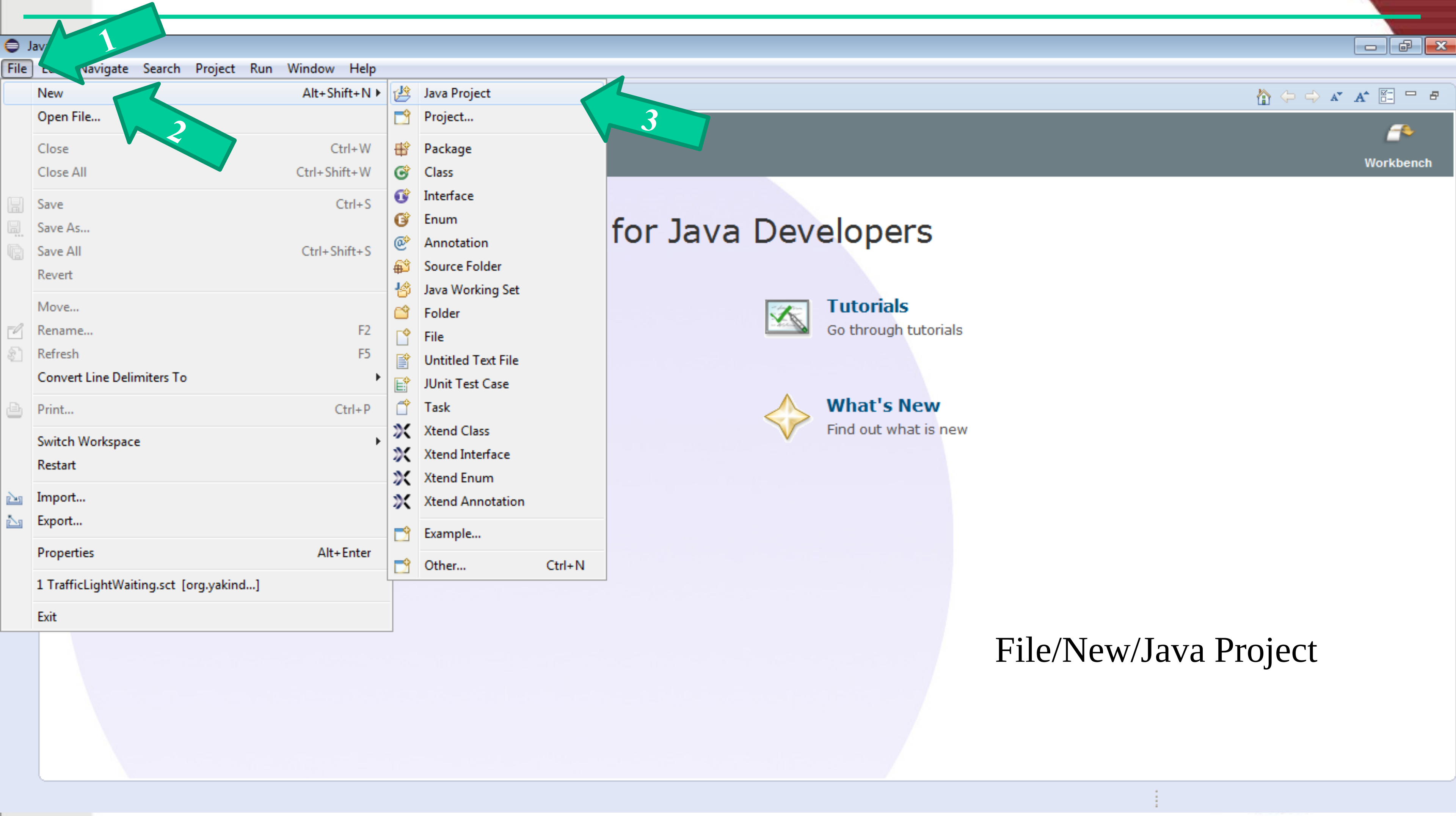
Samples Try out the samples

What's New Find out what is new

You are then greeted with the regular Eclipse welcome window

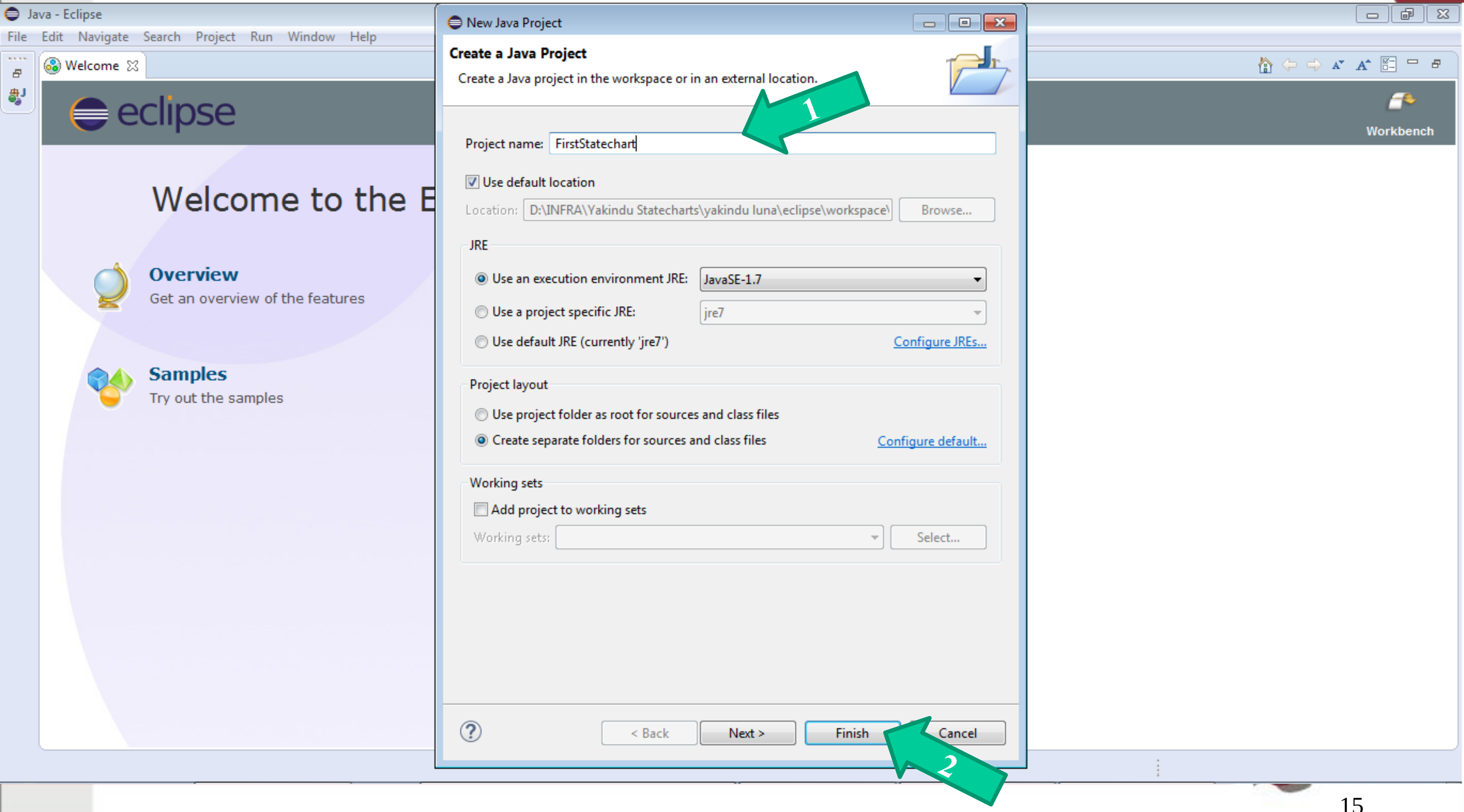
Creating a new project

Creating a new project (1/4)



File/New/Java Project

Creating a new project (2/4)



Create a Java Project

Create a Java project in the workspace or in an external location.

Project name: FirstStatechart

☑ Use default location

Location: D:\INFRA\Yakindu Statecharts\yakindu luna\eclipse\workspace\ [Browse...]

JRE

● Use an execution environment JRE: JavaSE-1.7

○ Use a project specific JRE: jre7

○ Use default JRE (currently 'jre7') Configure JREs...

Project layout

○ Use project folder as root for sources and class files

● Create separate folders for sources and class files Configure default...

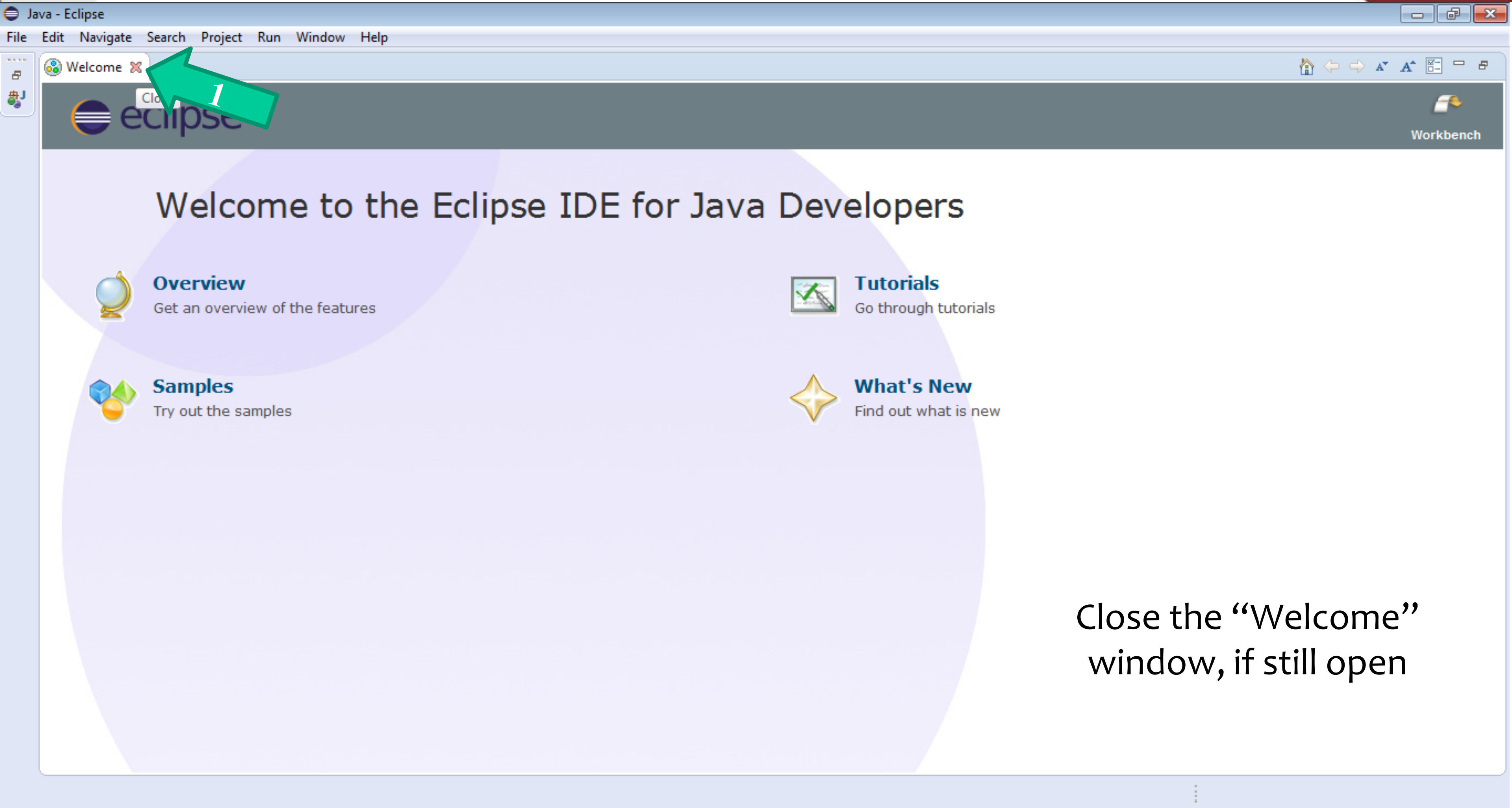
Working sets

□ Add project to working sets

Working sets: [Select...]

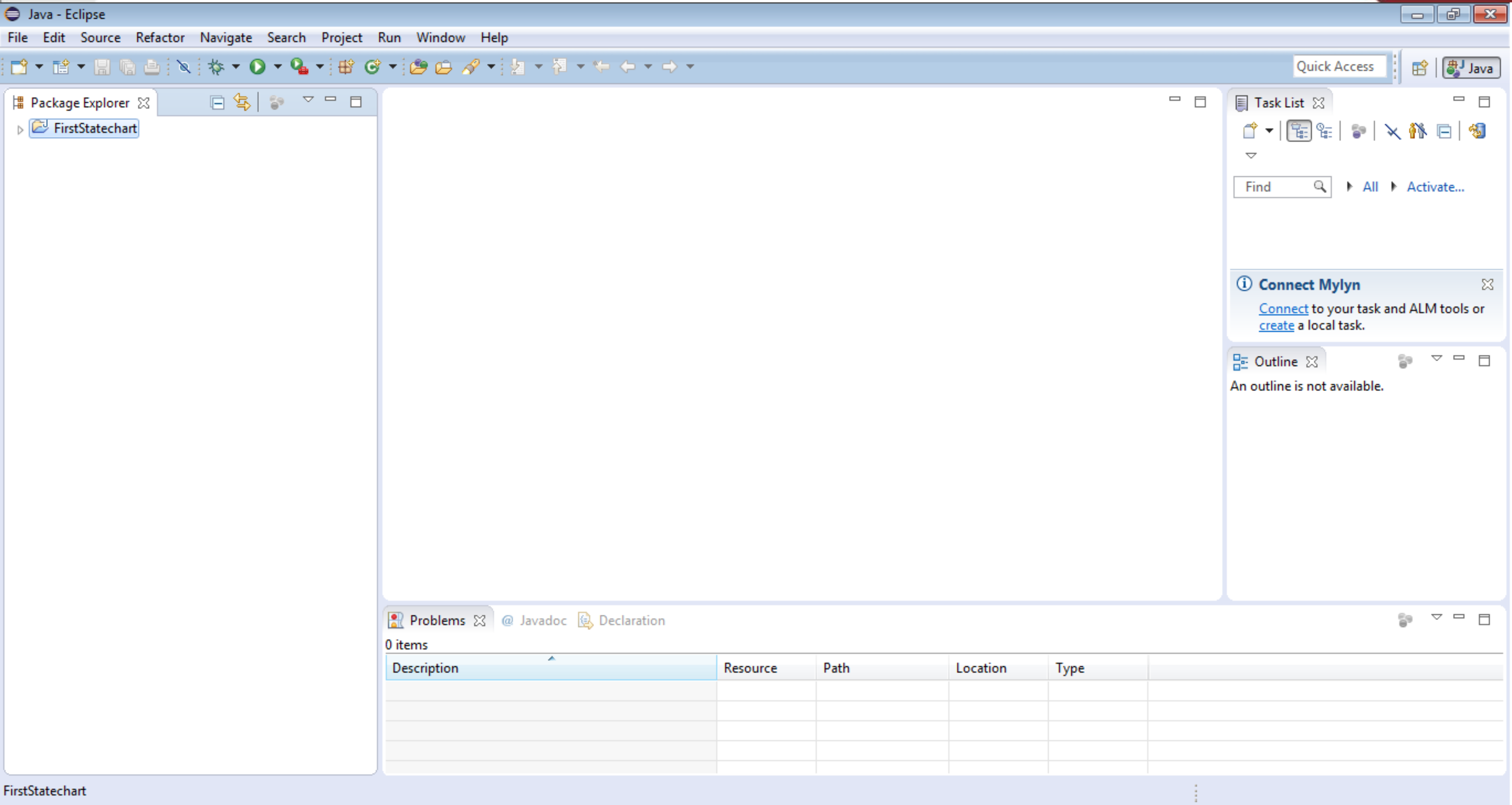
[< Back] [Next >] [Finish] [Cancel]

Creating a new project (3/4)



Close the "Welcome" window, if still open

Creating a new project (4/4)



Connect Mylyn

Connect to your task and ALM tools or create a local task.

An outline is not available.

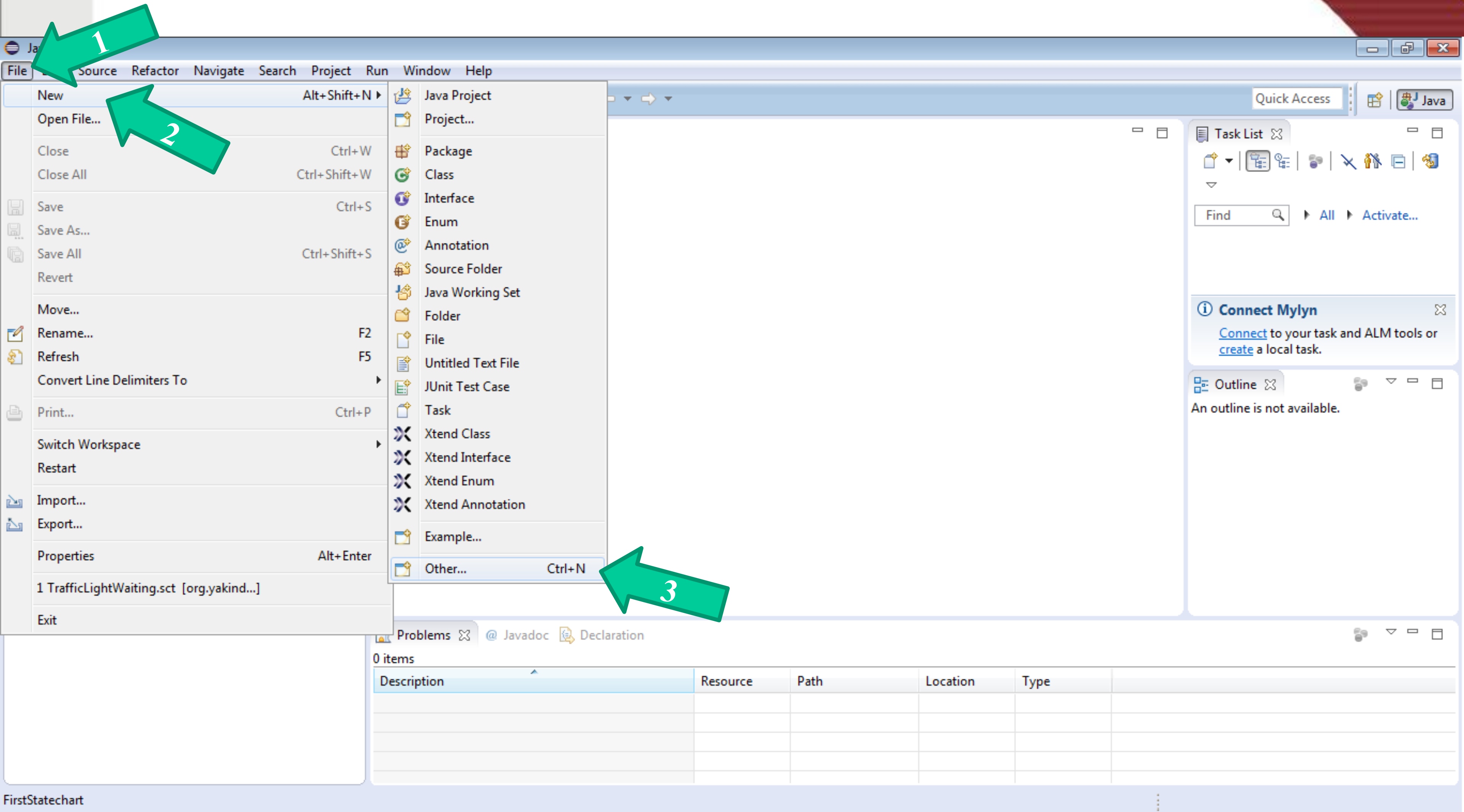
0 items

Description	Resource	Path	Location	Type

FirstStatechart

Creating a new statechart

Creating a new statechart (1/5)

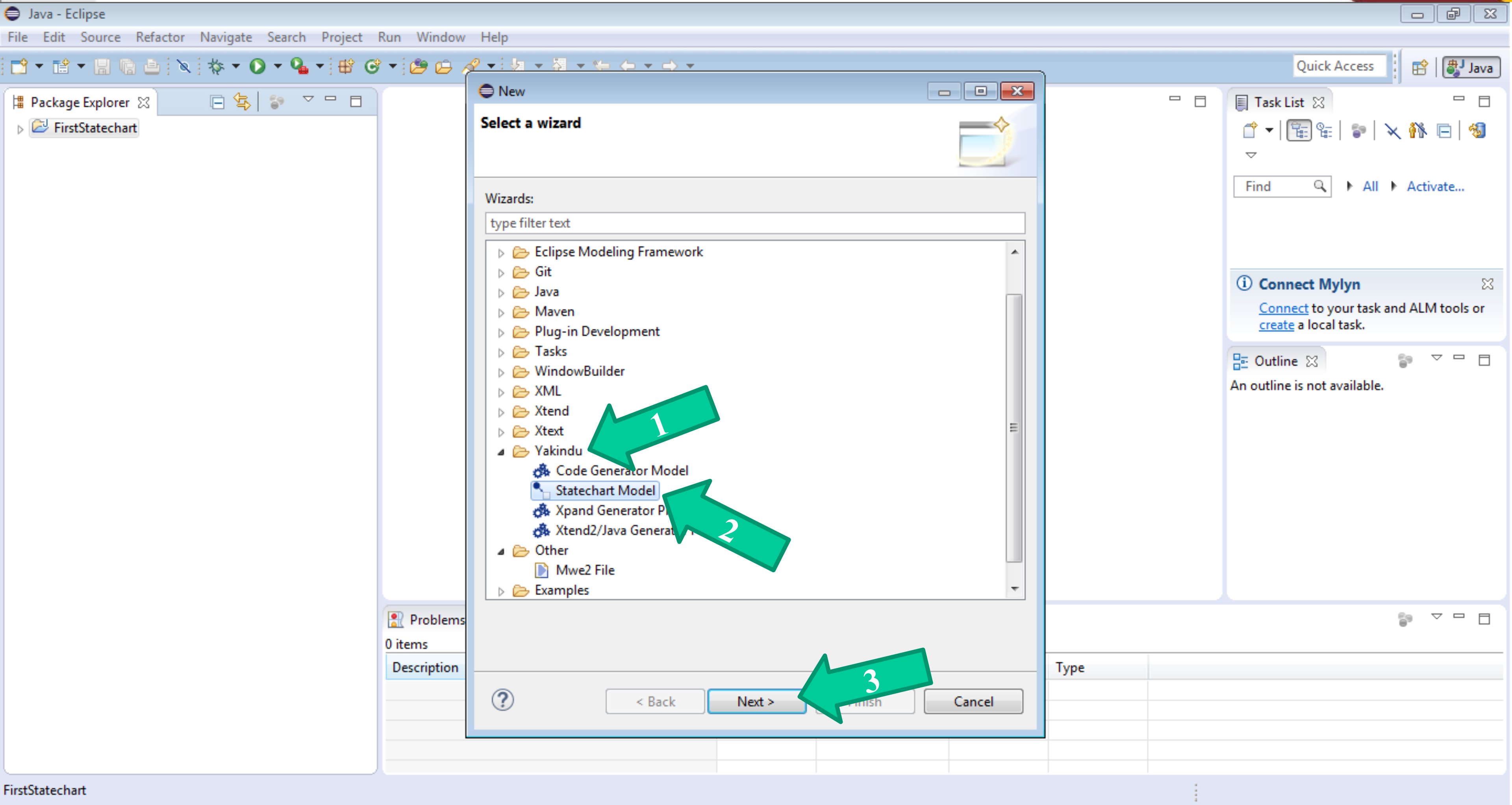


Connect to your task and ALM tools or create a local task.

An outline is not available.

0 items

Creating a new statechart (2/5)

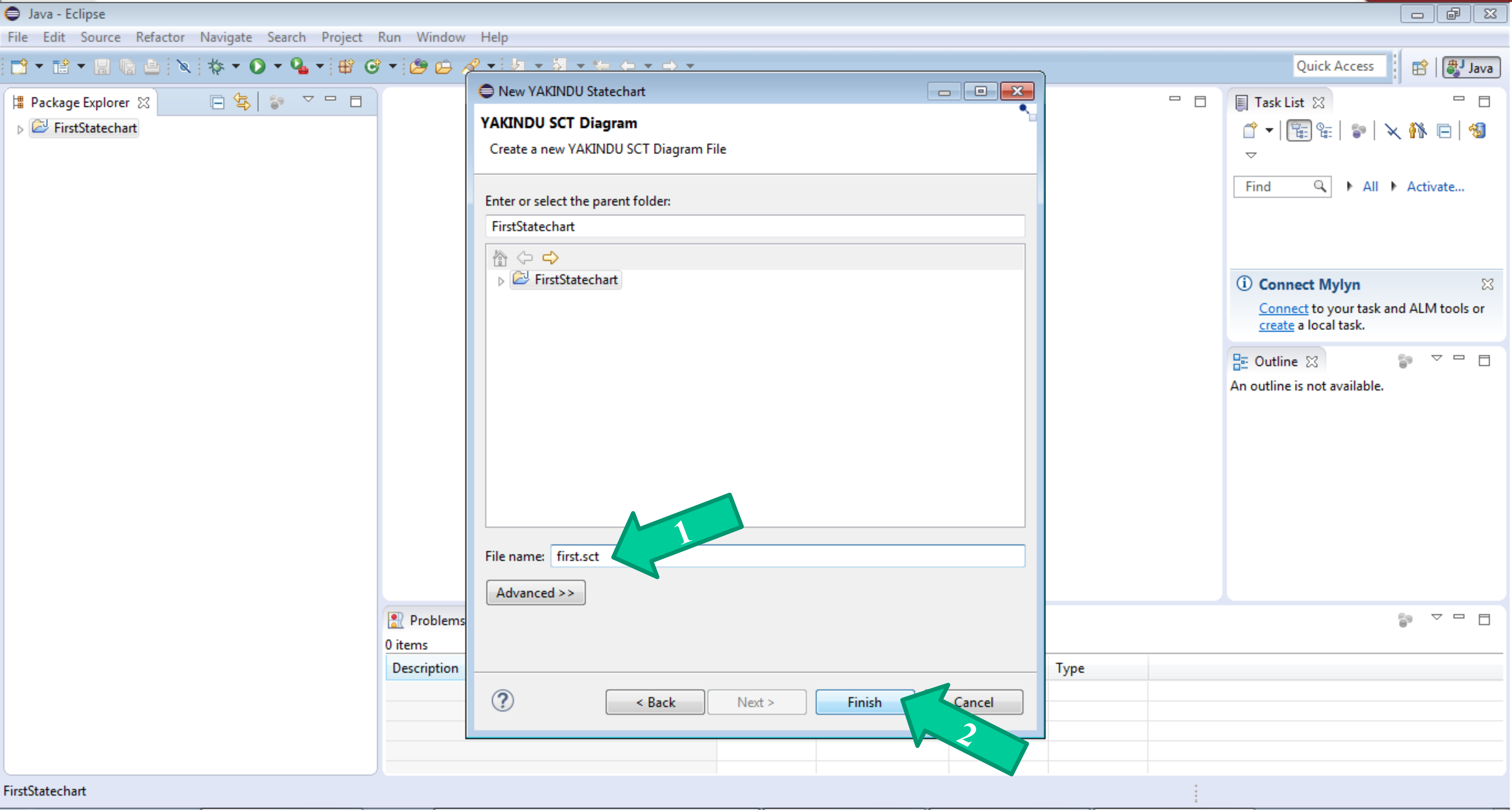


Connect to your task and ALM tools or create a local task.

An outline is not available.

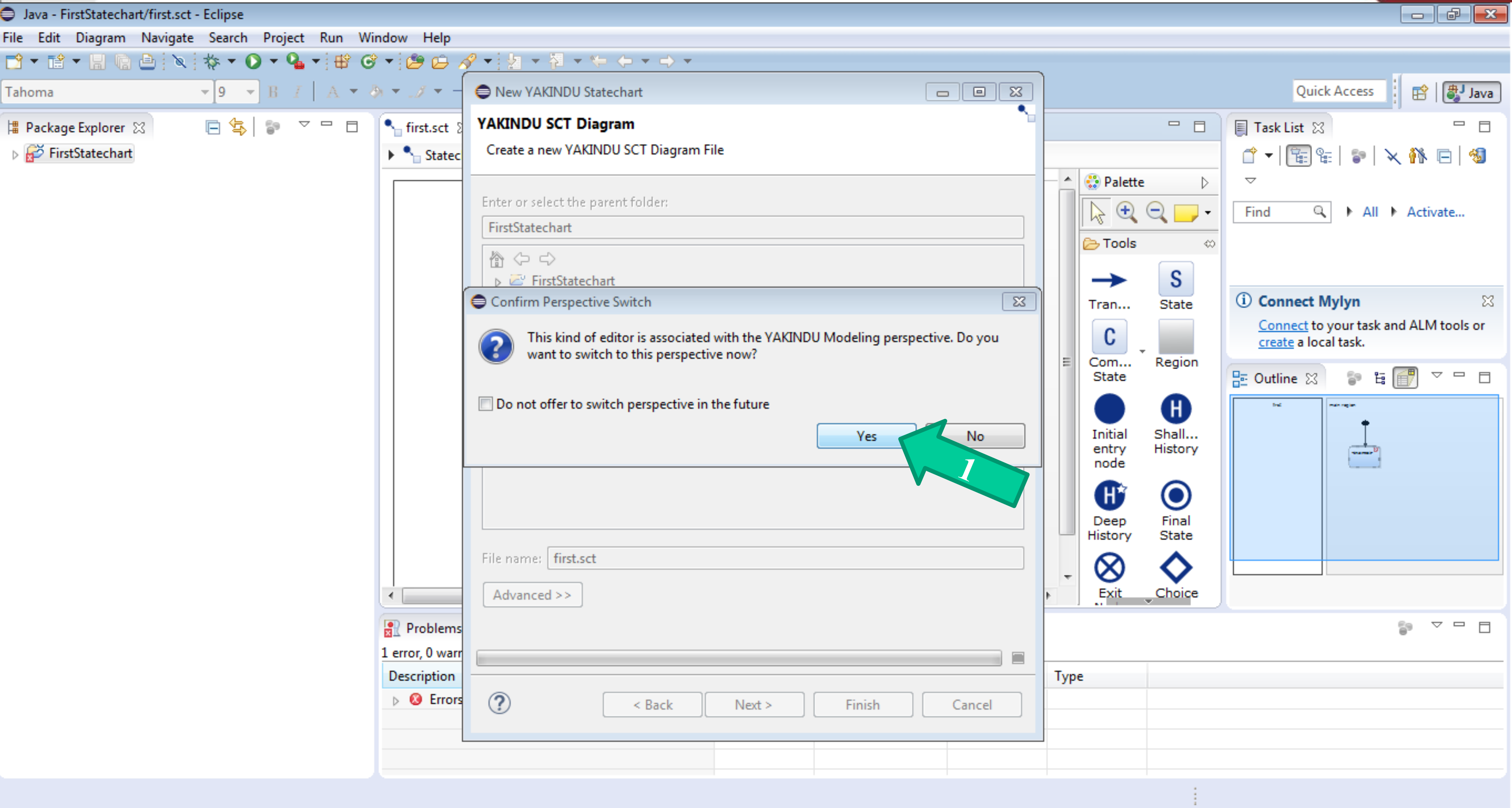
Yakindu/Statechart Model

Creating a new statechart (3/5)



1) Write a name for your statechart, with the ".sct" extension

Creating a new statechart (4/5)

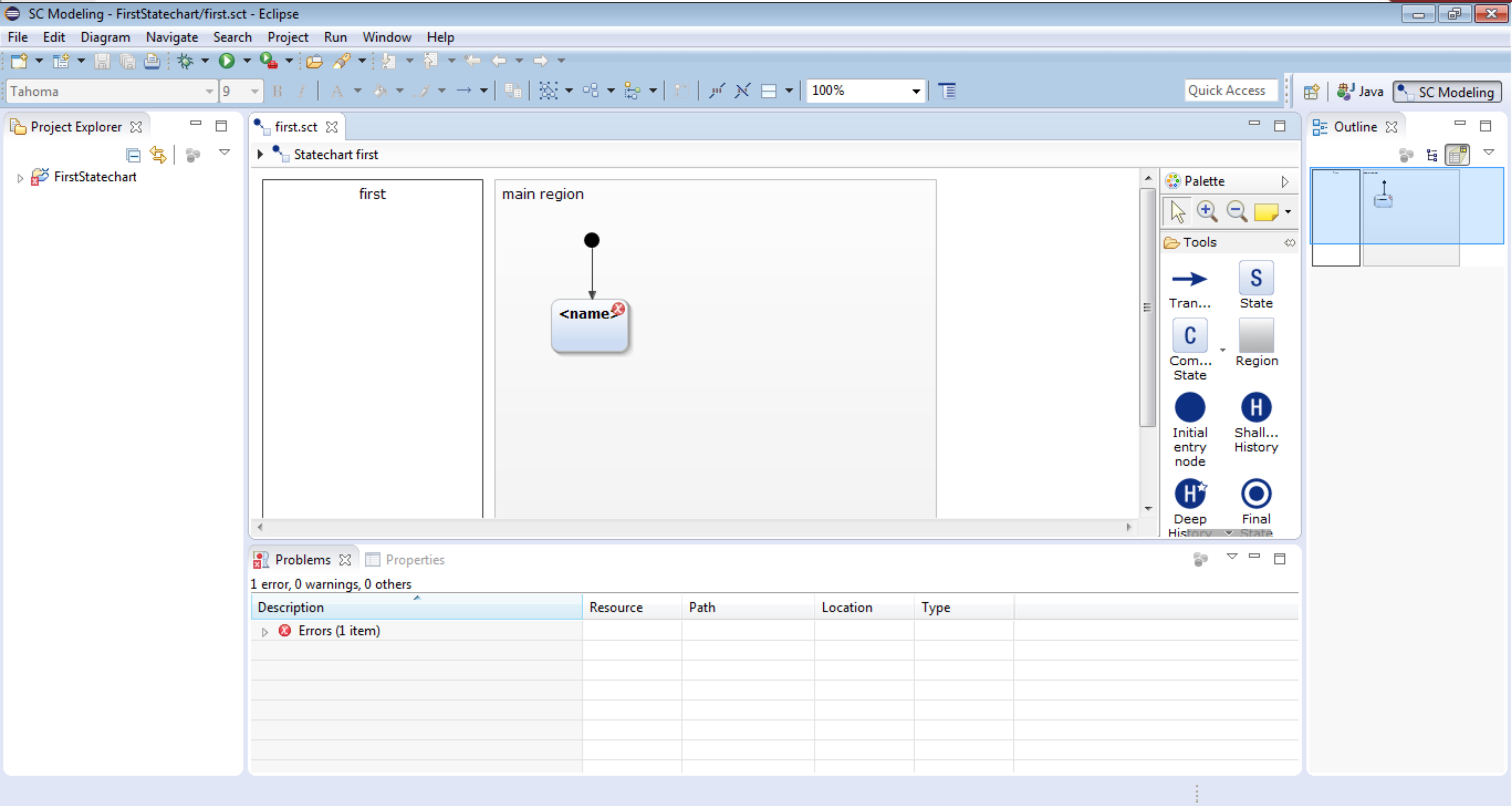


Confirm Perspective Switch

This kind of editor is associated with the YAKINDU Modeling perspective. Do you want to switch to this perspective now?

□ Do not offer to switch perspective in the future

Creating a new statechart (5/5)



SC Modeling - FirstStatechart/first.sct - Eclipse

File Edit Diagram Navigate Search Project Run Window Help

Problems

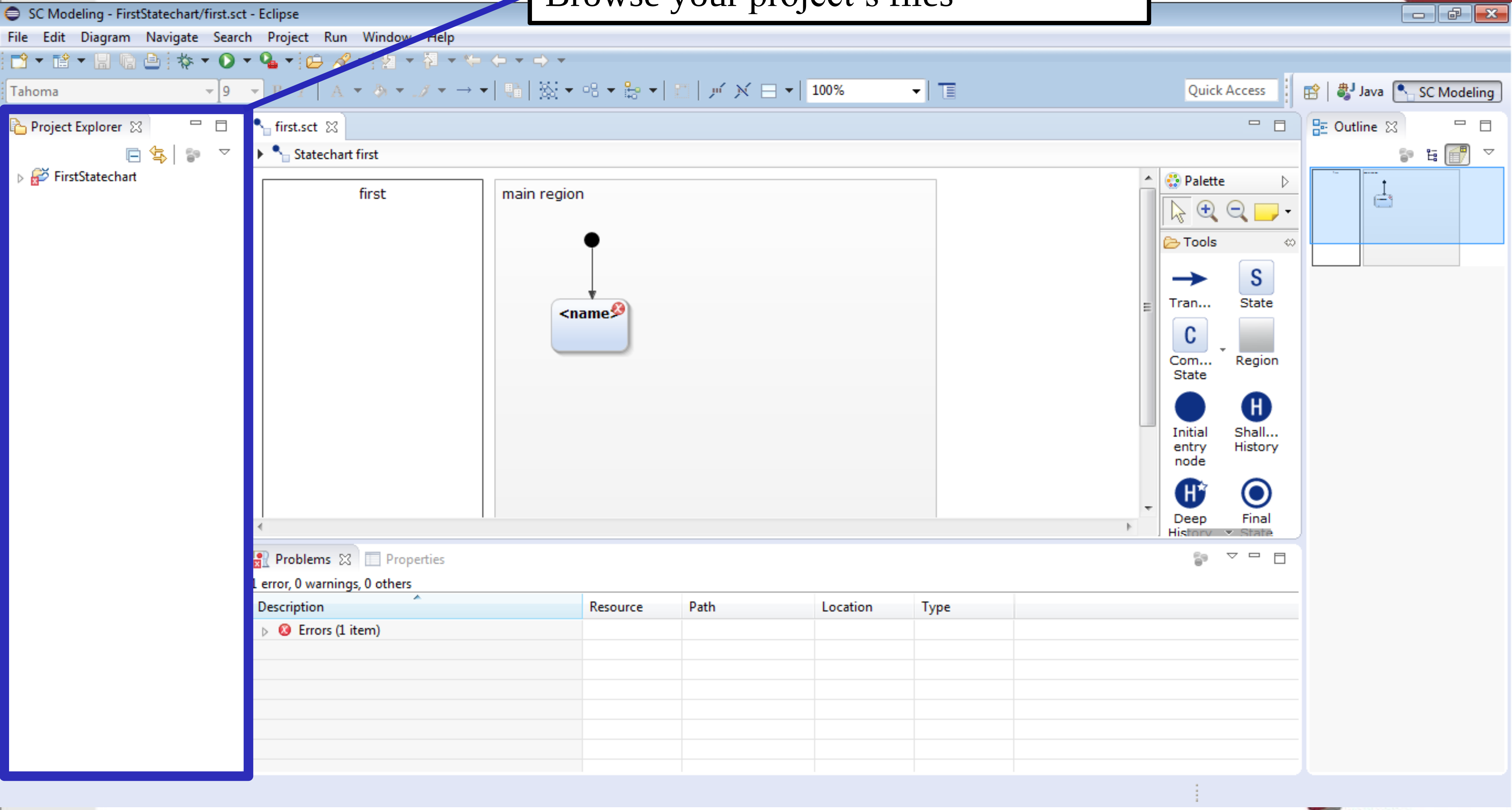
1 error, 0 warnings, 0 others

Description	Resource	Path	Location	Type
Errors (1 item)				

Getting to know the environment

Project Explorer

Browse your project's files

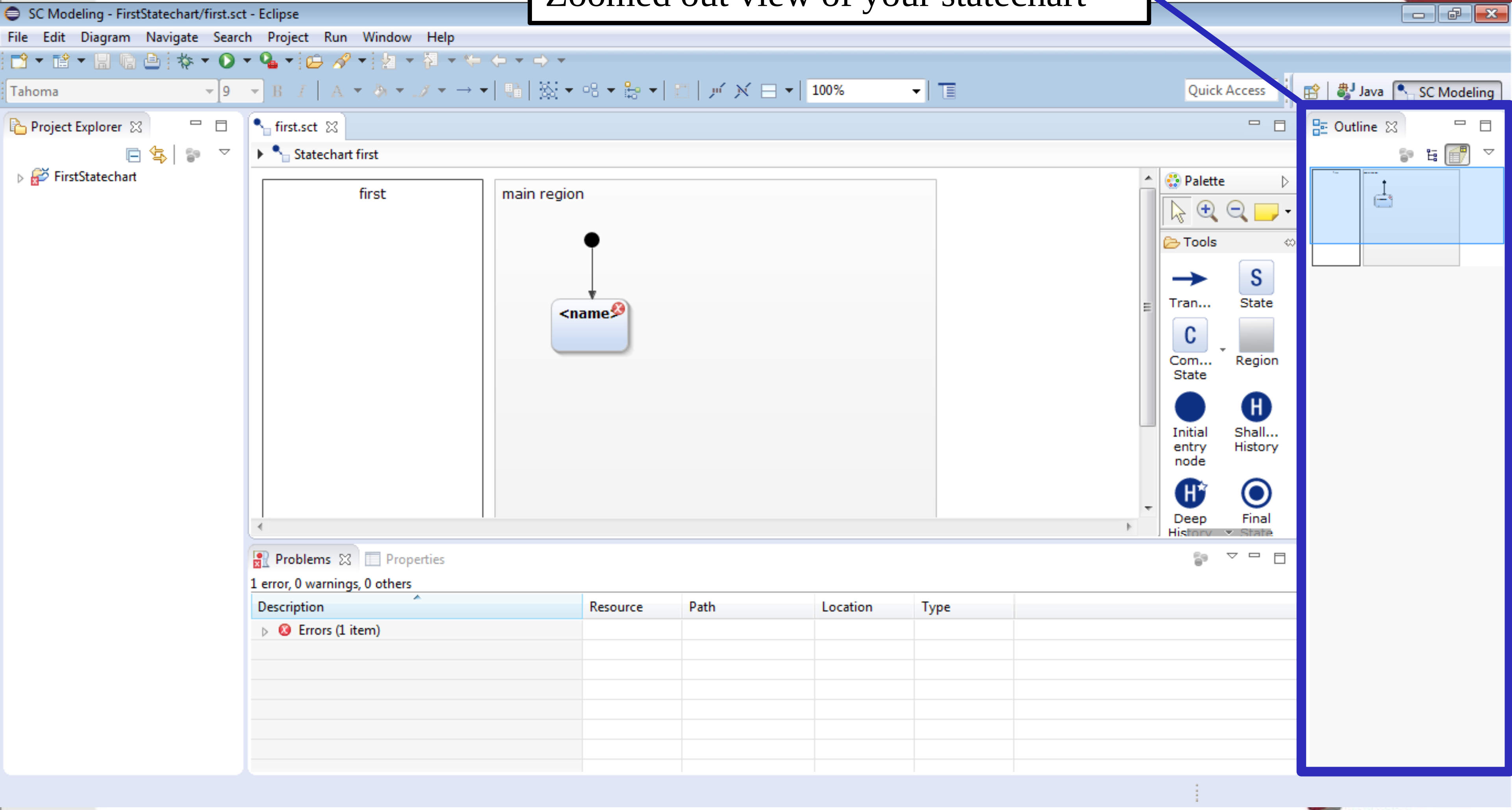


1 error, 0 warnings, 0 others

Description	Resource	Path	Location	Type
Errors (1 item)				

Outline

Zoomed out view of your statechart

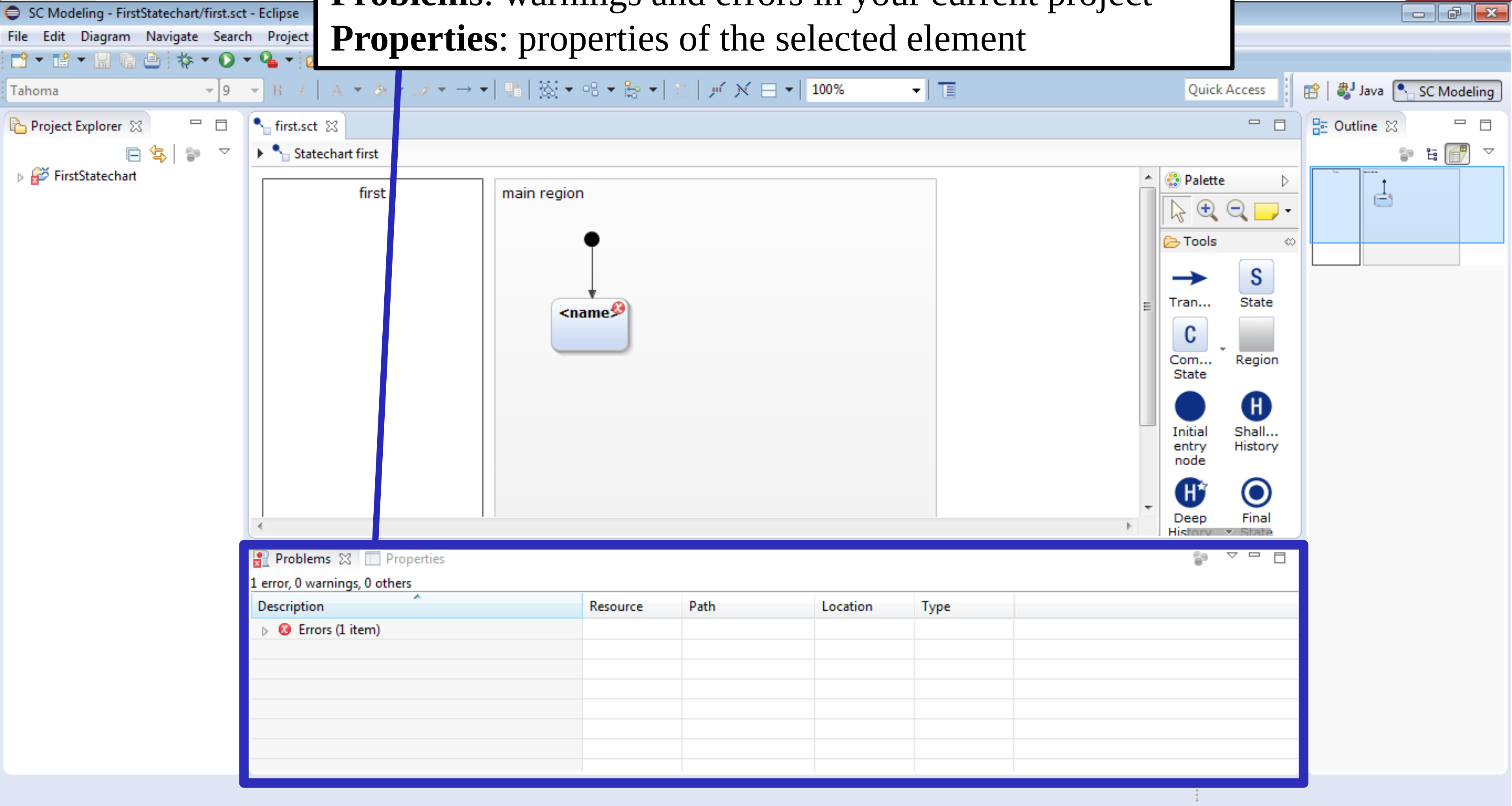


1 error, 0 warnings, 0 others

Description	Resource	Path	Location	Type
Errors (1 item)				

Problems/Properties

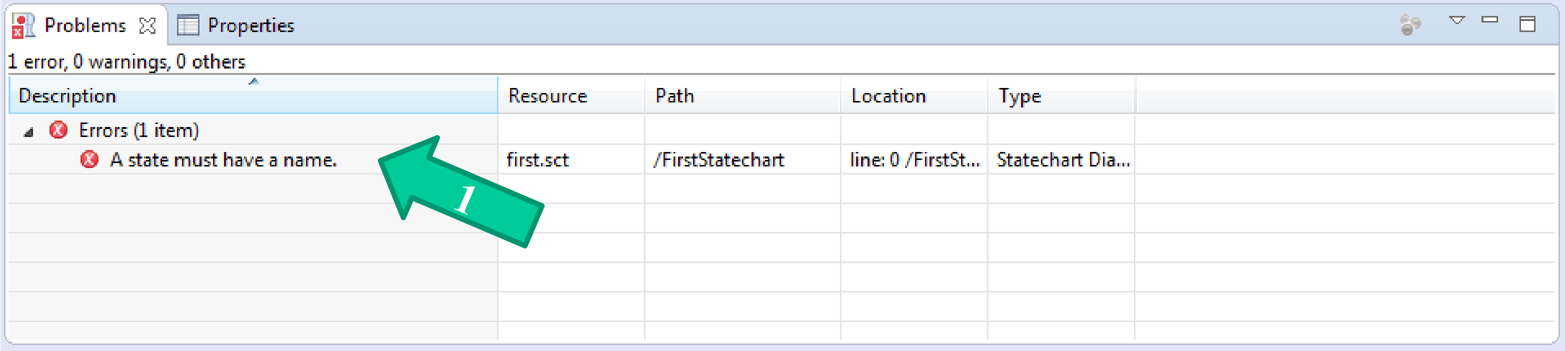
Problems: warnings and errors in your current project
Properties: properties of the selected element



1 error, 0 warnings, 0 others

Description	Resource	Path	Location	Type
Errors (1 item)				

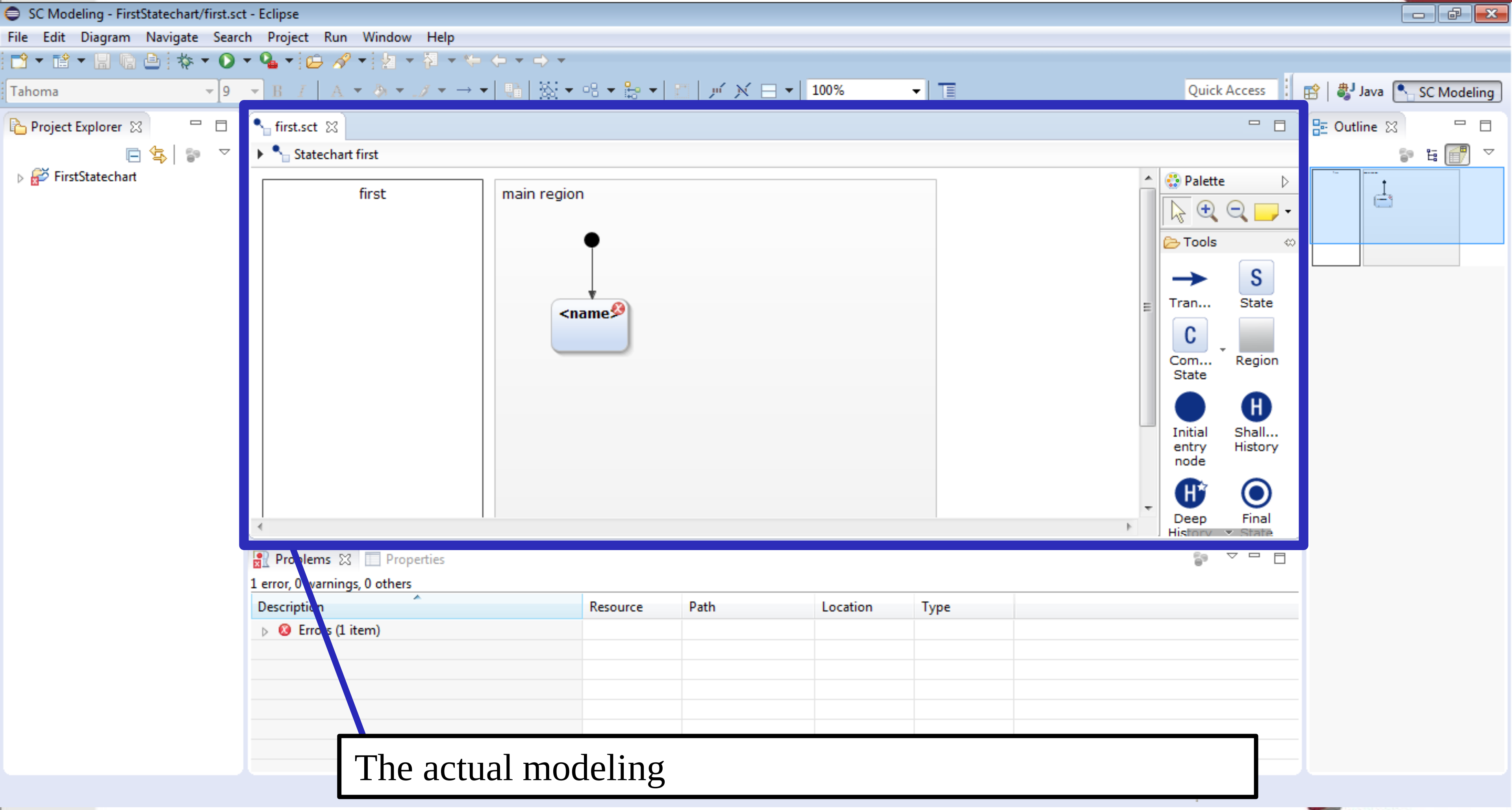
Problems



1 error, 0 warnings, 0 others

Description	Resource	Path	Location	Type
Errors (1 item)				
A state must have a name.	first.sct	/FirstStatechart	line: 0 /FirstSt...	Statechart Dia...

Main Panel (1/4)

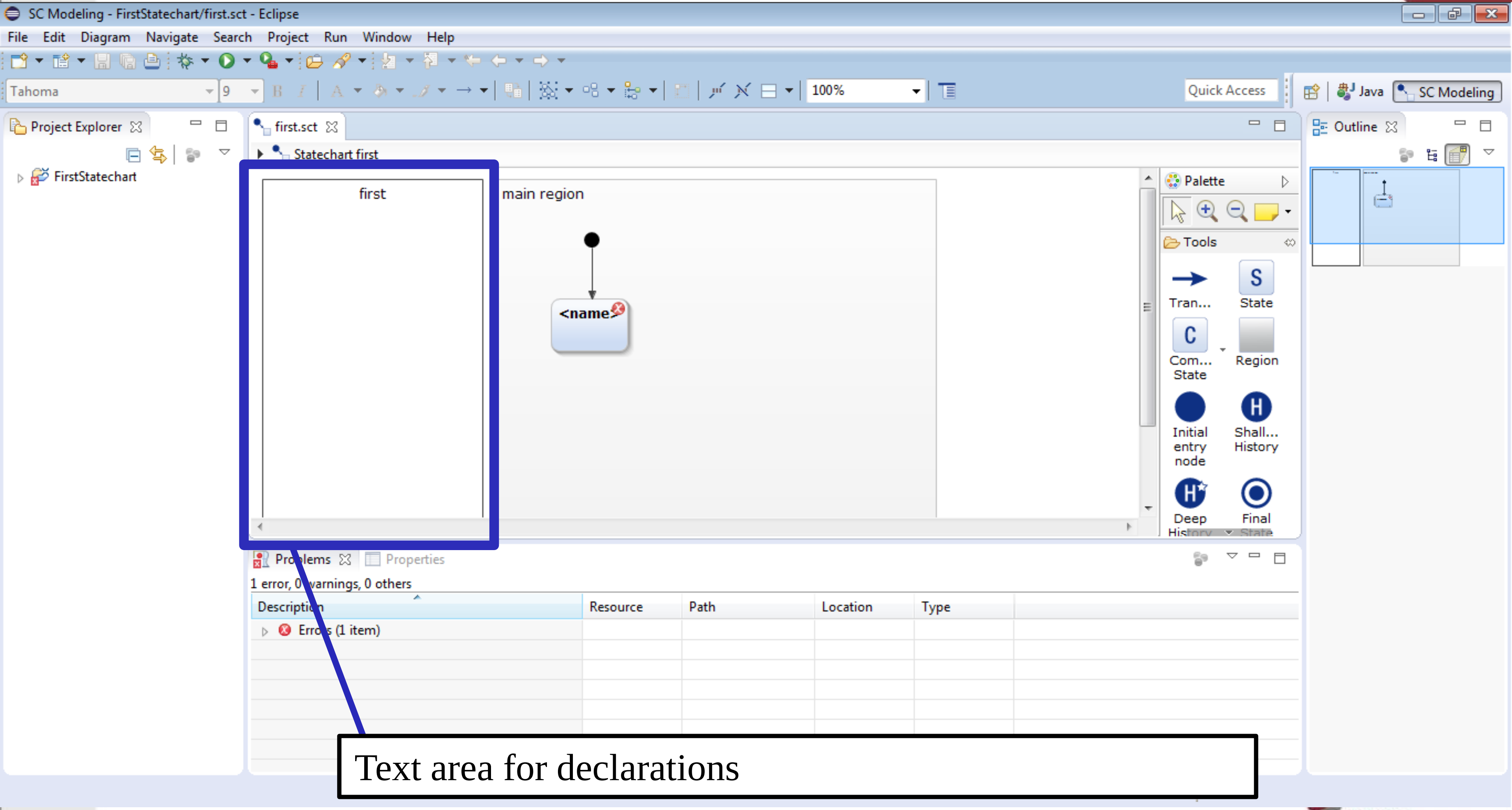


1 error, 0 warnings, 0 others

Errors (1 item)

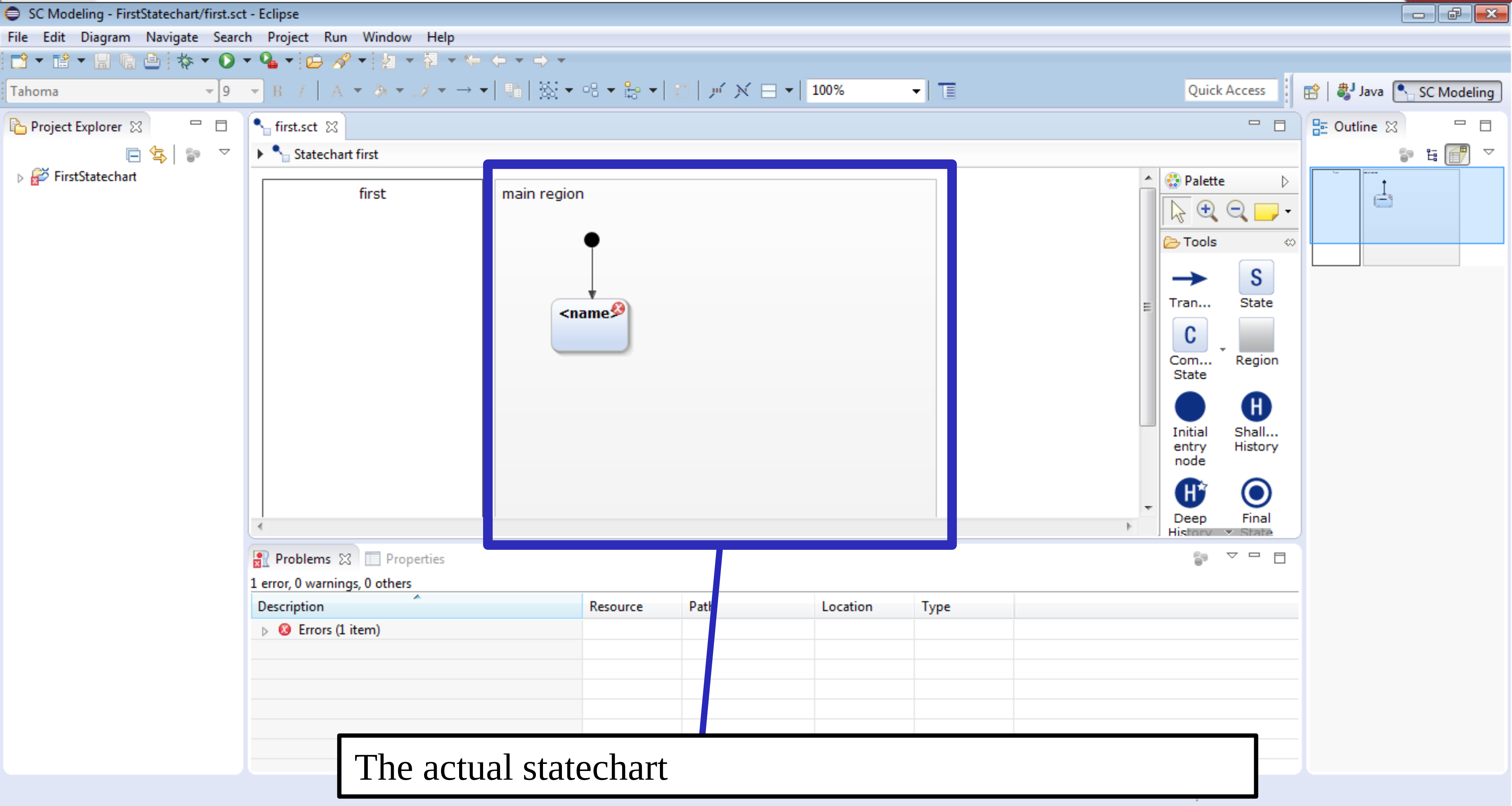
The actual modeling

Main Panel (2/4)



Text area for declarations

Main Panel (3/4)



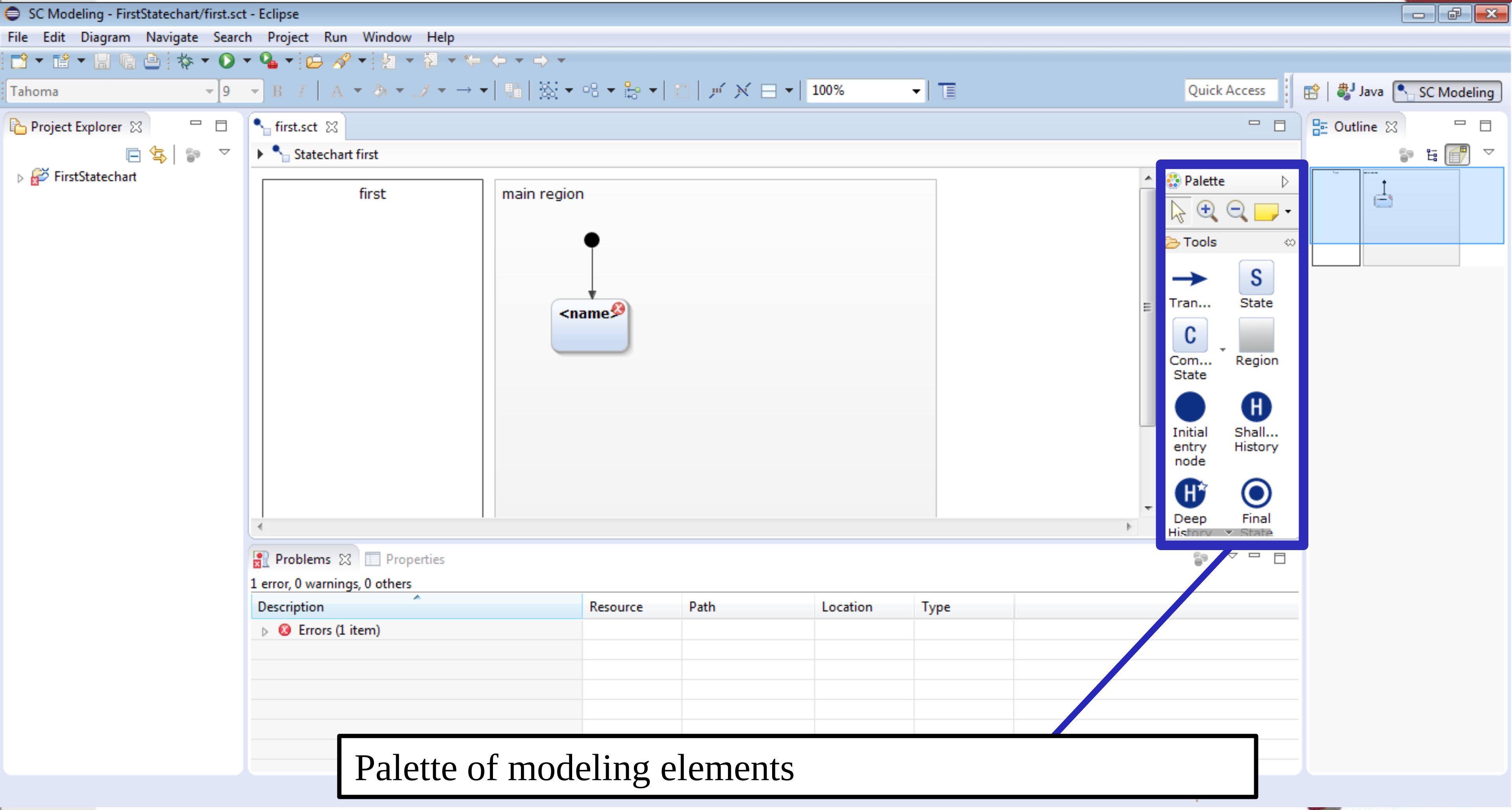
SC Modeling - FirstStatechart/first.sct - Eclipse

1 error, 0 warnings, 0 others

Description	Resource	Path	Location	Type
Errors (1 item)				

The actual statechart

Main Panel (3/4)

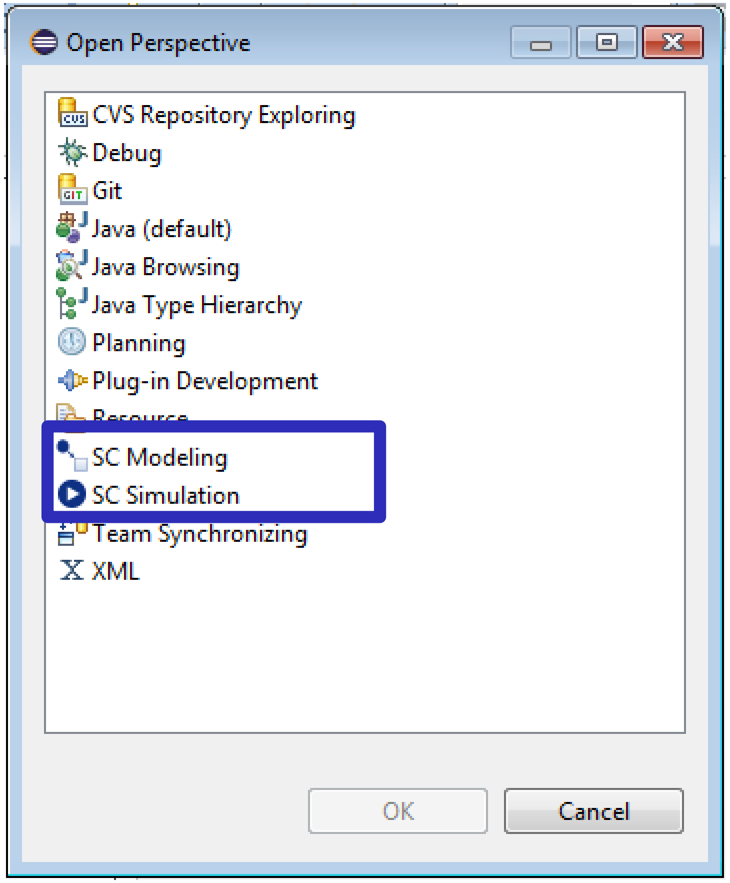


1 error, 0 warnings, 0 others

Description	Resource	Path	Location	Type
Errors (1 item)				

Palette of modeling elements

Perspective

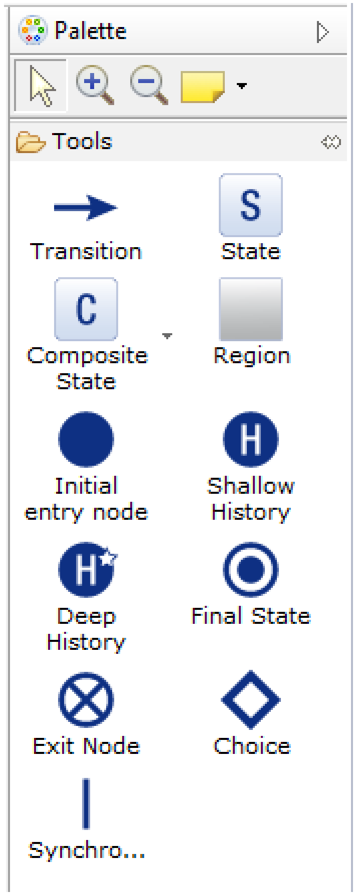


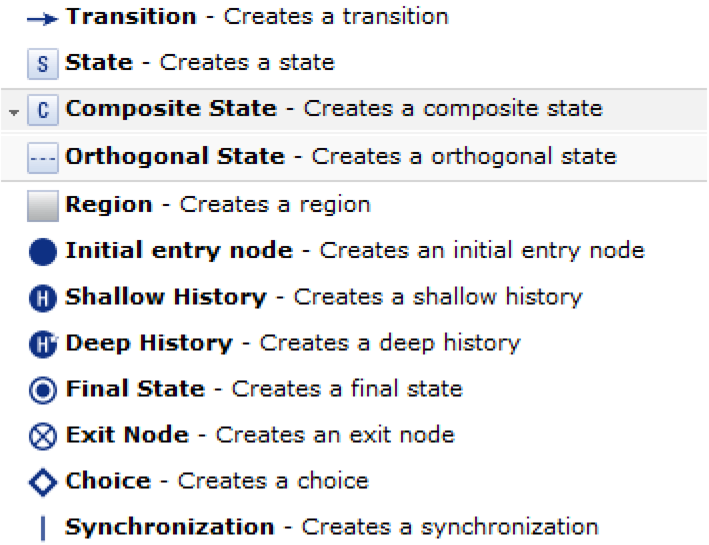
Open Perspective

- CVS Repository Exploring
- Debug
- Git
- Java (default)
- Java Browsing
- Java Type Hierarchy
- Planning
- Plug-in Development
- Resource
- SC Modeling
- SC Simulation
- Team Synchronizing
- XML

Inserting elements

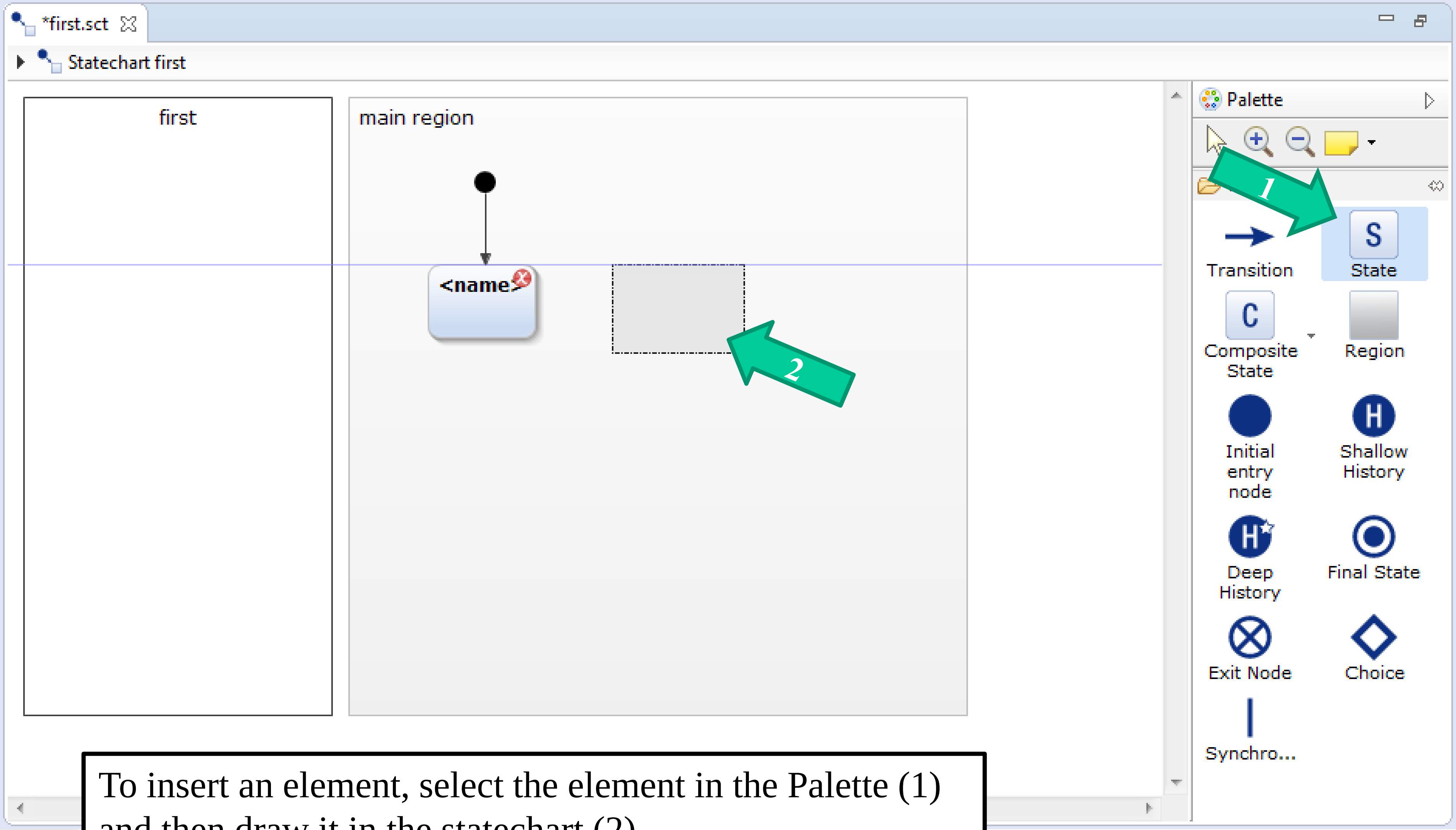
Pallete





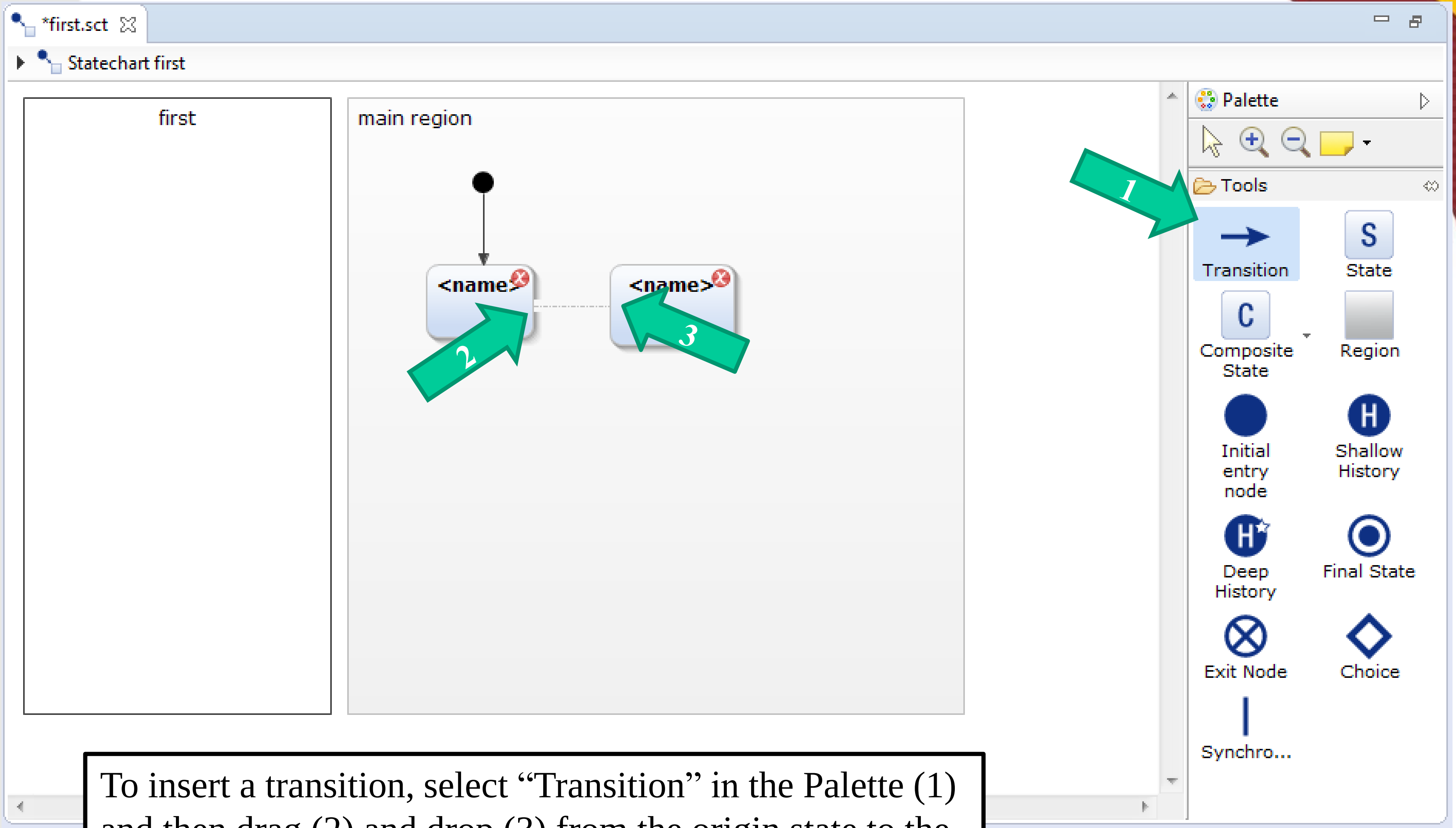
- **Transition** - Creates a transition
- S **State** - Creates a state
- C **Composite State** - Creates a composite state
- **Orthogonal State** - Creates a orthogonal state
- **Region** - Creates a region
- ● **Initial entry node** - Creates an initial entry node
- H **Shallow History** - Creates a shallow history
- H* **Deep History** - Creates a deep history
- ◉ **Final State** - Creates a final state
- ⊗ **Exit Node** - Creates an exit node
- ◇ **Choice** - Creates a choice
- | **Synchronization** - Creates a synchronization

Inserting elements



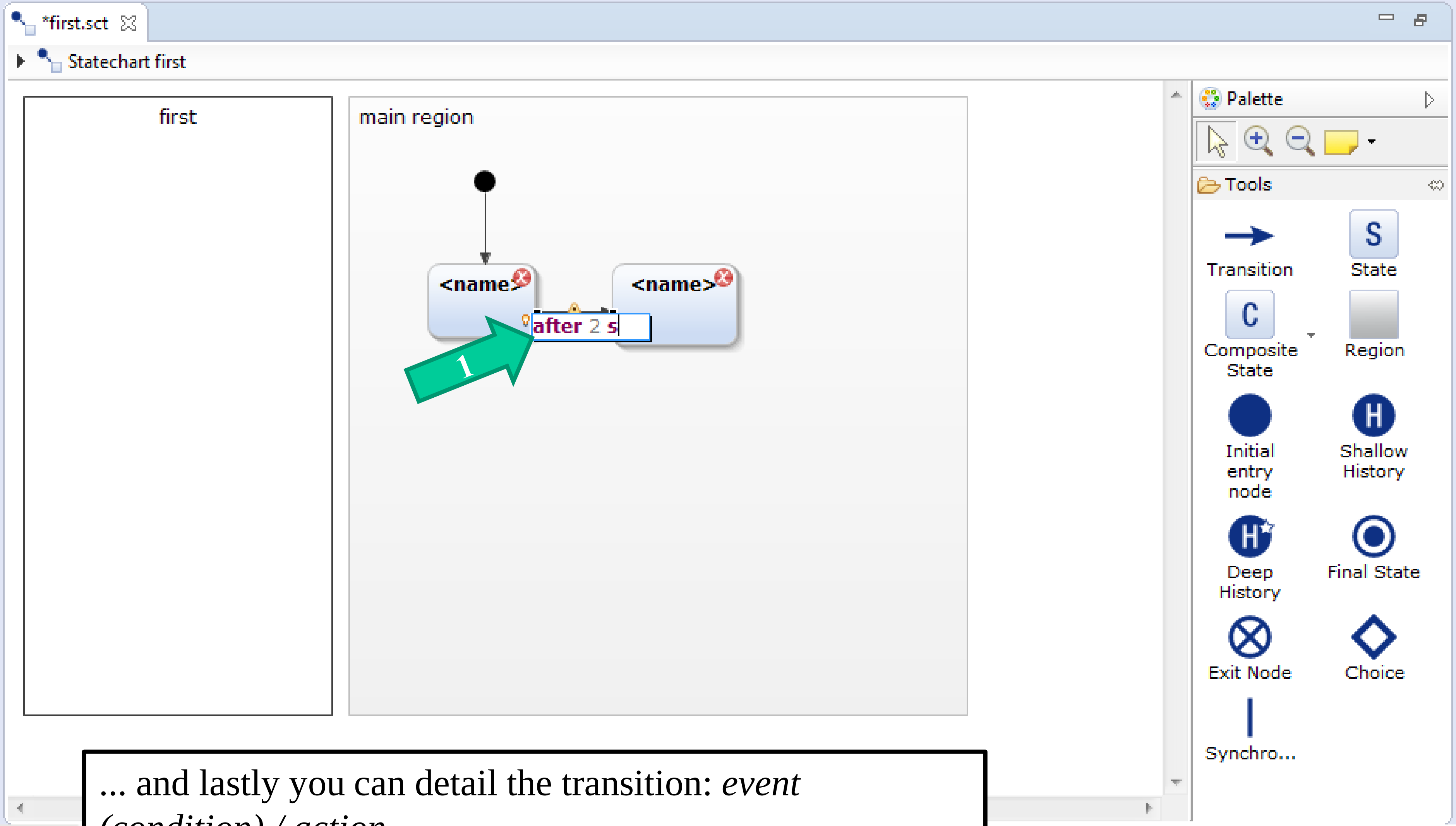
To insert an element, select the element in the Palette (1) and then draw it in the statechart (2)

Inserting transitions (1/2)



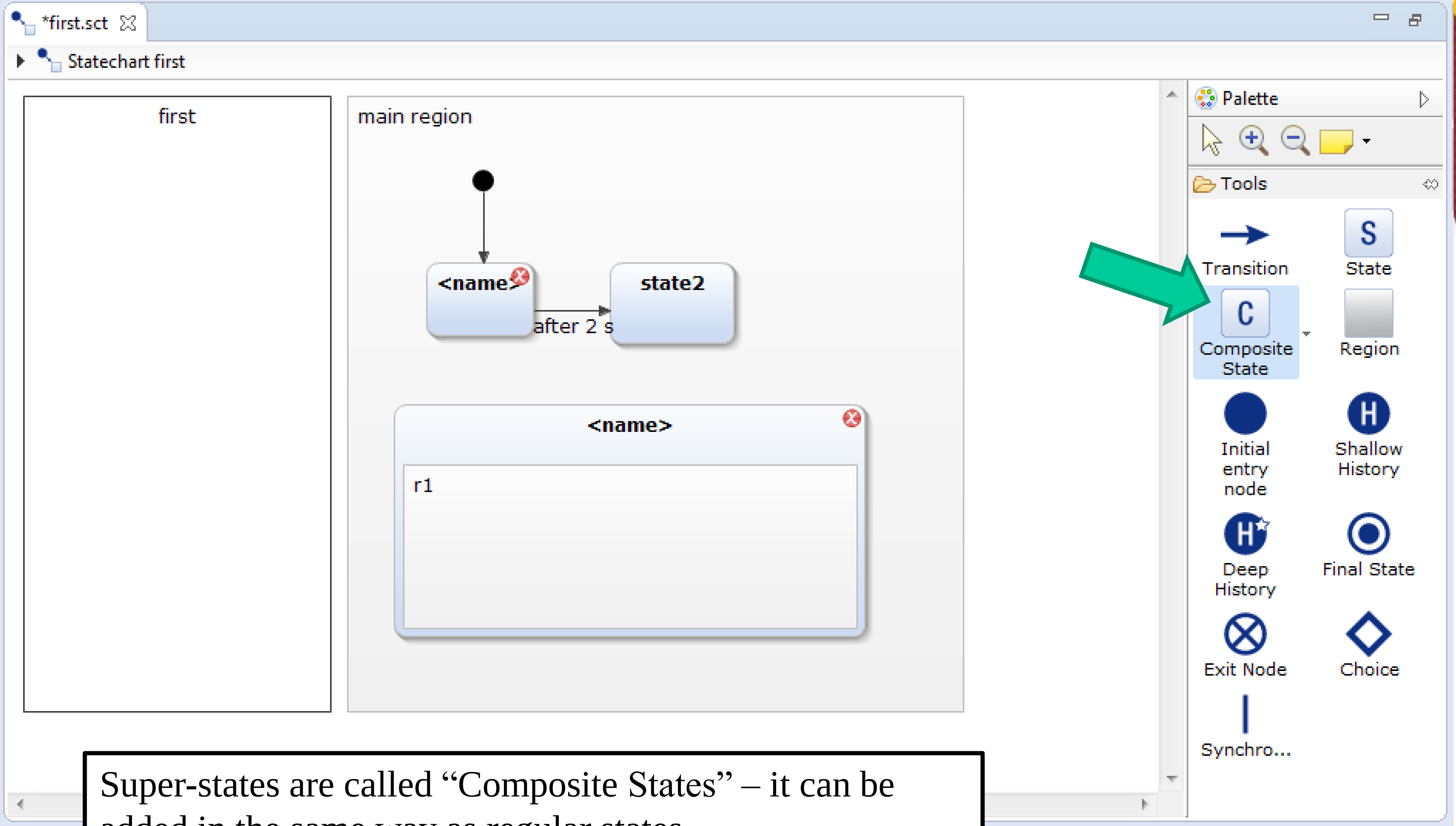
To insert a transition, select "Transition" in the Palette (1) and then drag (2) and drop (3) from the origin state to the target state...

Inserting transitions (2/2)



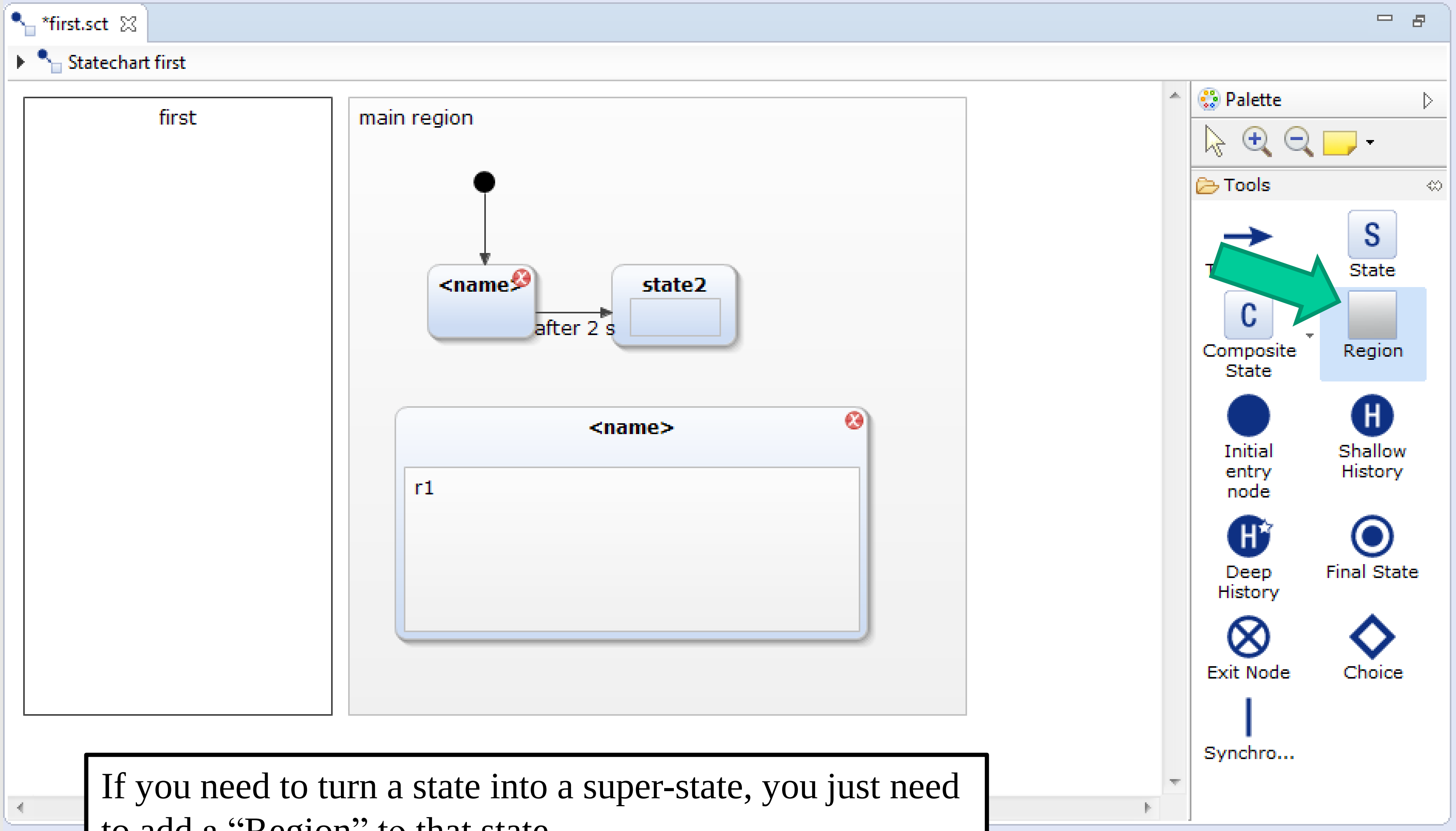
... and lastly you can detail the transition: *event (condition) / action*

Inserting super-states (1/2)



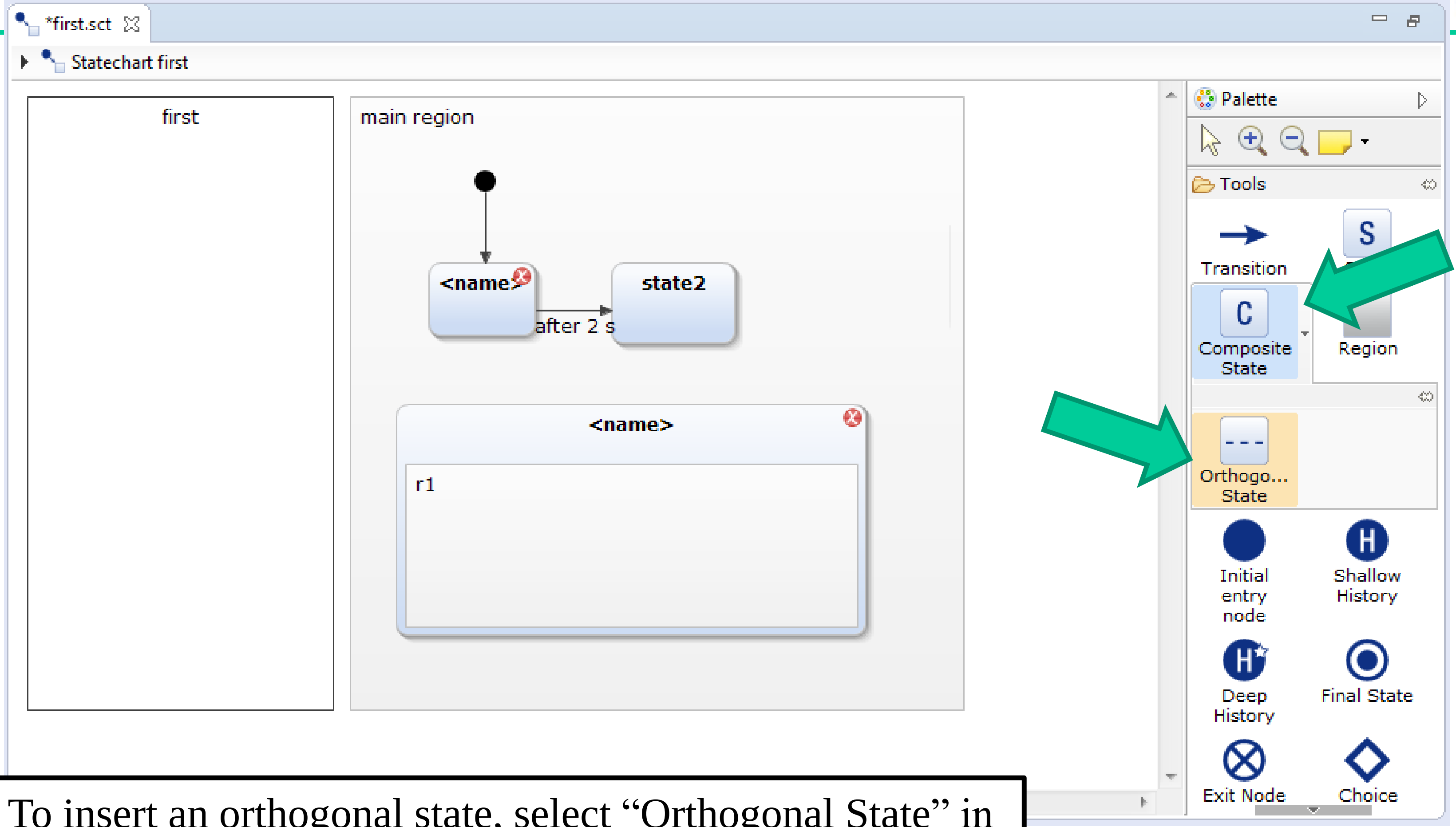
Super-states are called “Composite States” – it can be added in the same way as regular states

Inserting super-states (2/2)



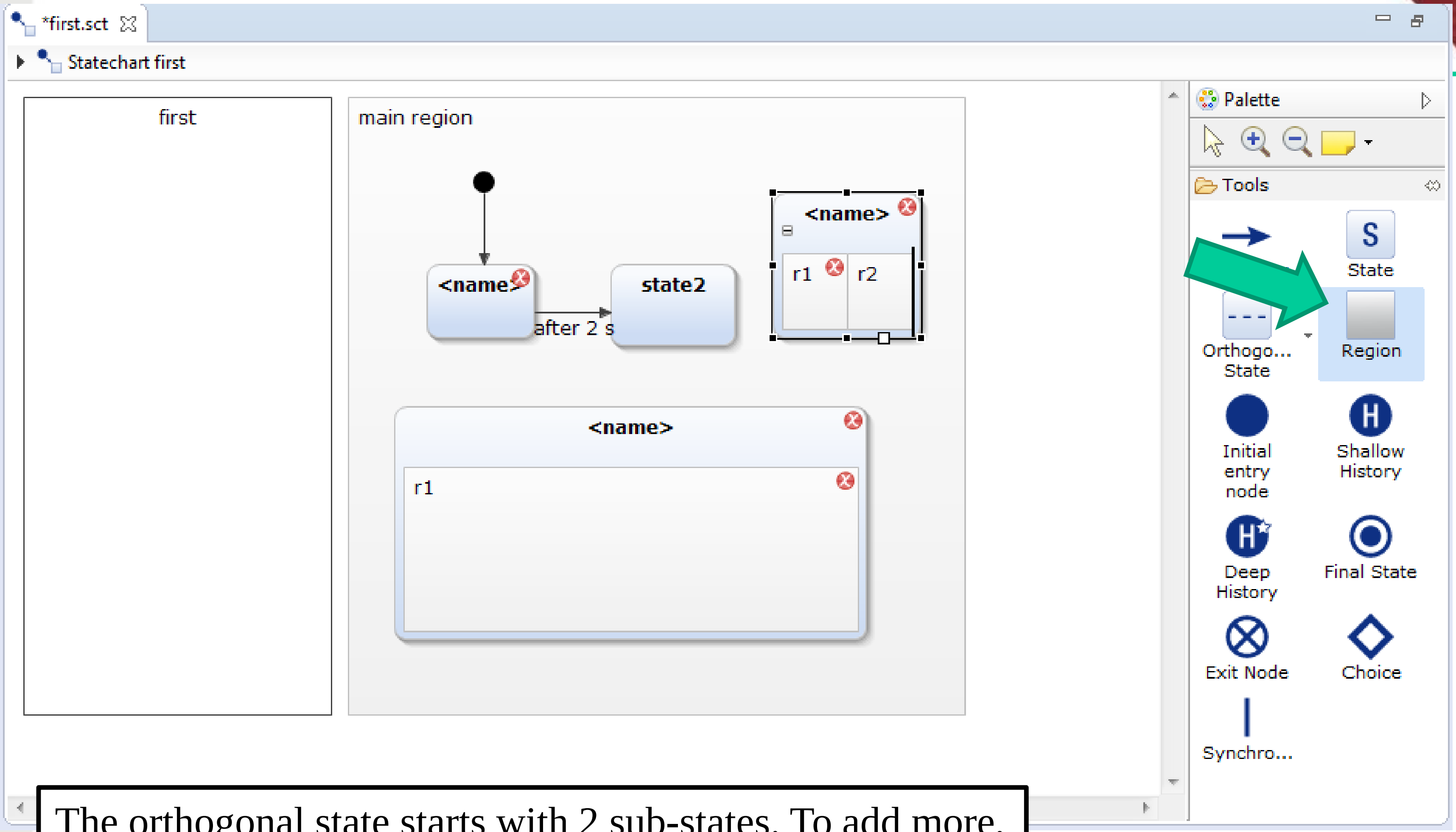
If you need to turn a state into a super-state, you just need to add a “Region” to that state

Inserting orthogonal states (1/3)



To insert an orthogonal state, select “Orthogonal State” in the pallete (drop-down menu of “Composite State”), then just insert it as a regular state

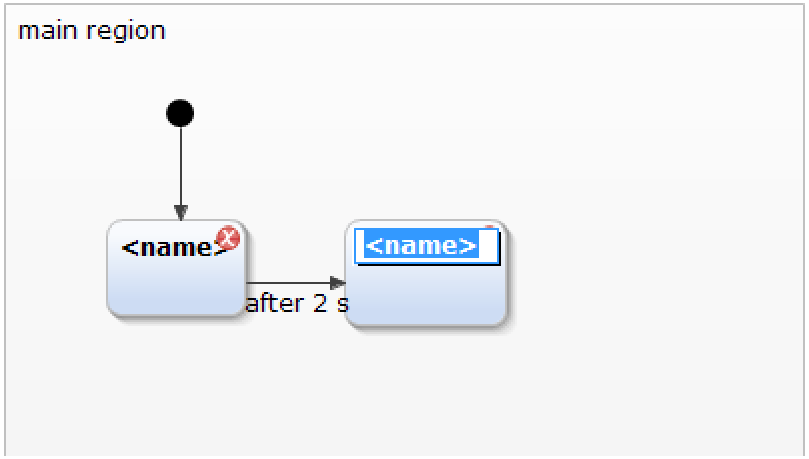
Inserting orthogonal states (2/3)



The orthogonal state starts with 2 sub-states. To add more, insert a region

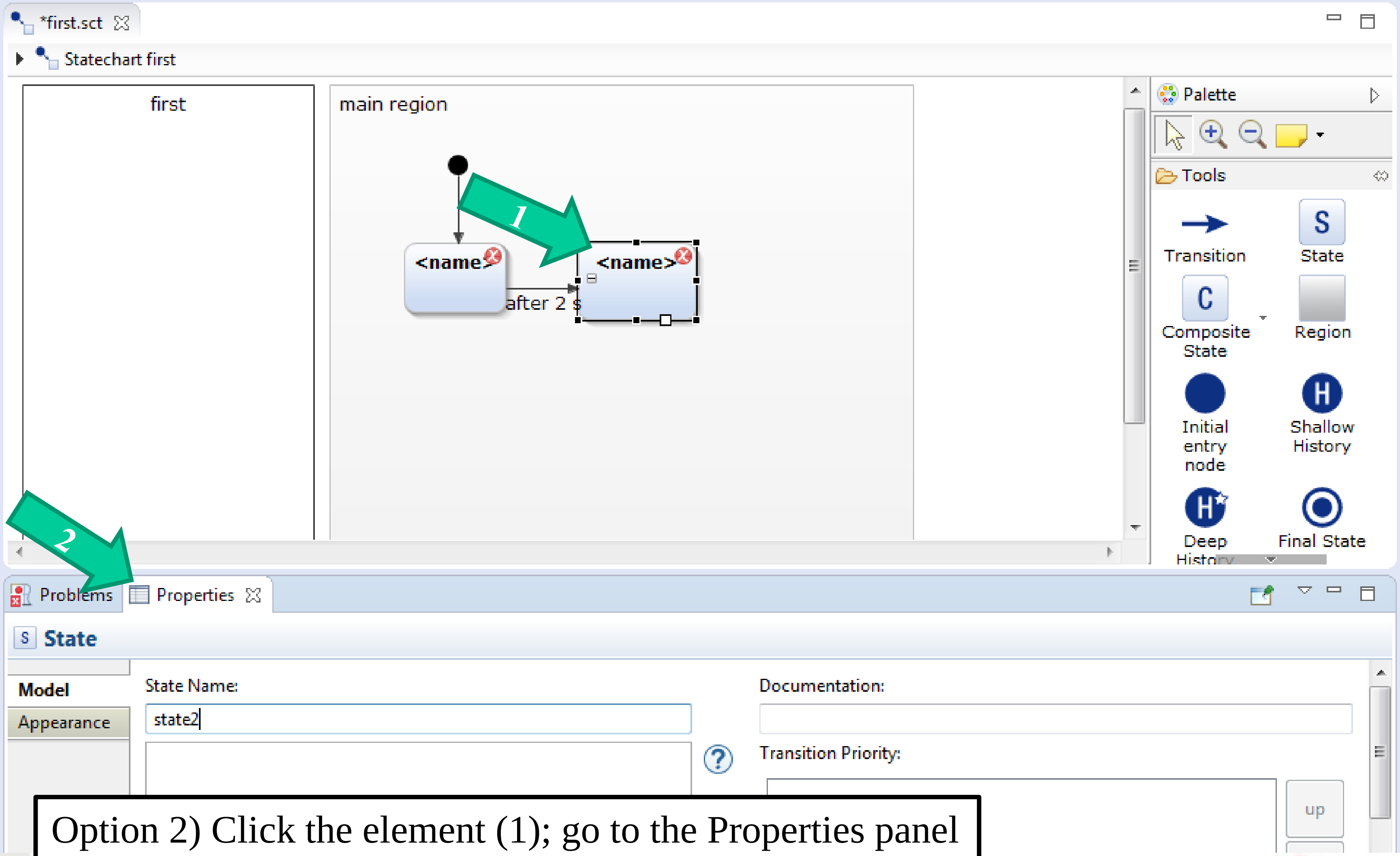
Editing elements

Editing elements (1/2)



Option 1) Double-click the element; write; press Enter.

Editing elements (2/2)



State Name: state2

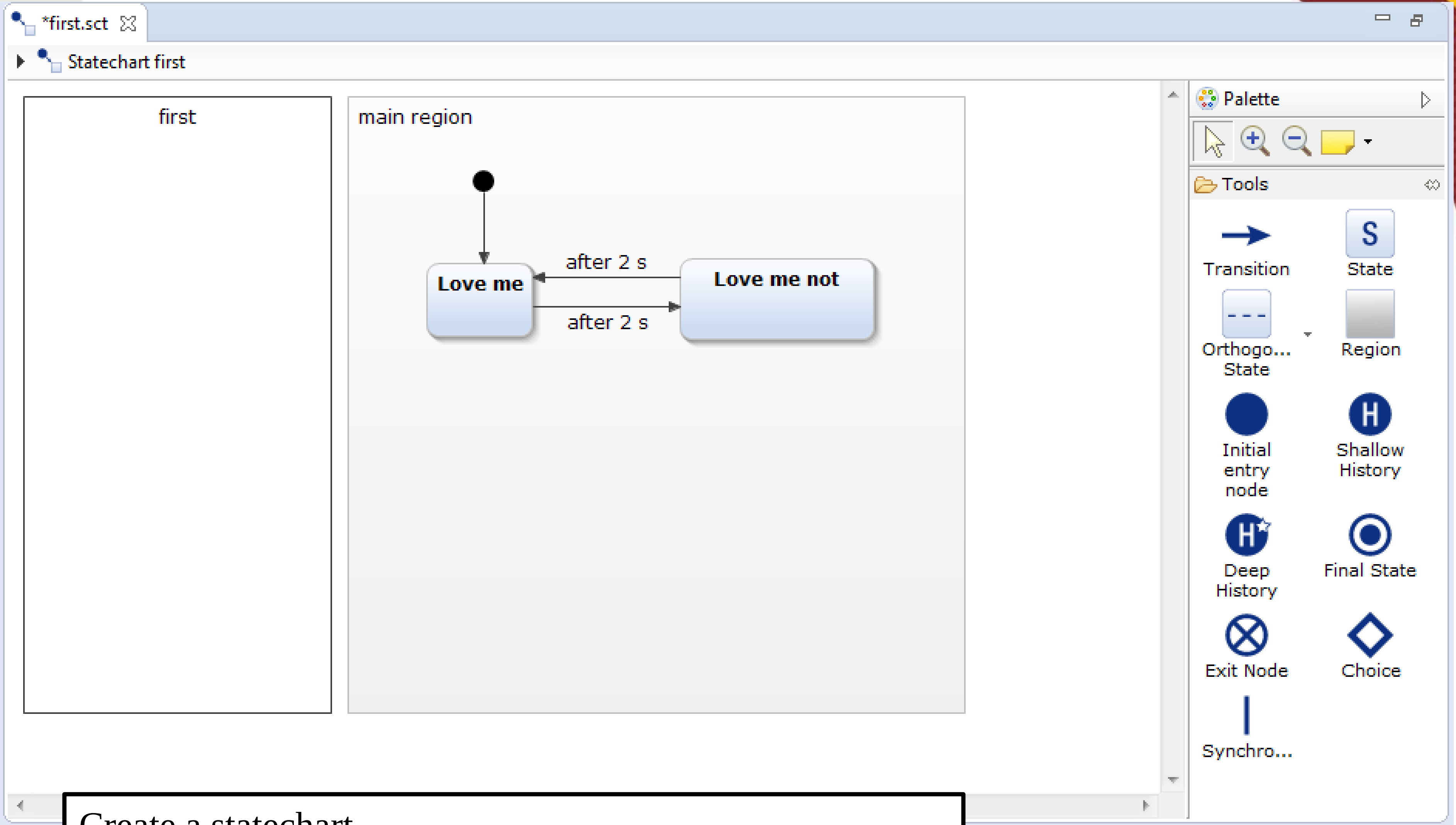
Documentation:

Transition Priority:

Option 2) Click the element (1); go to the Properties panel (2); edit.

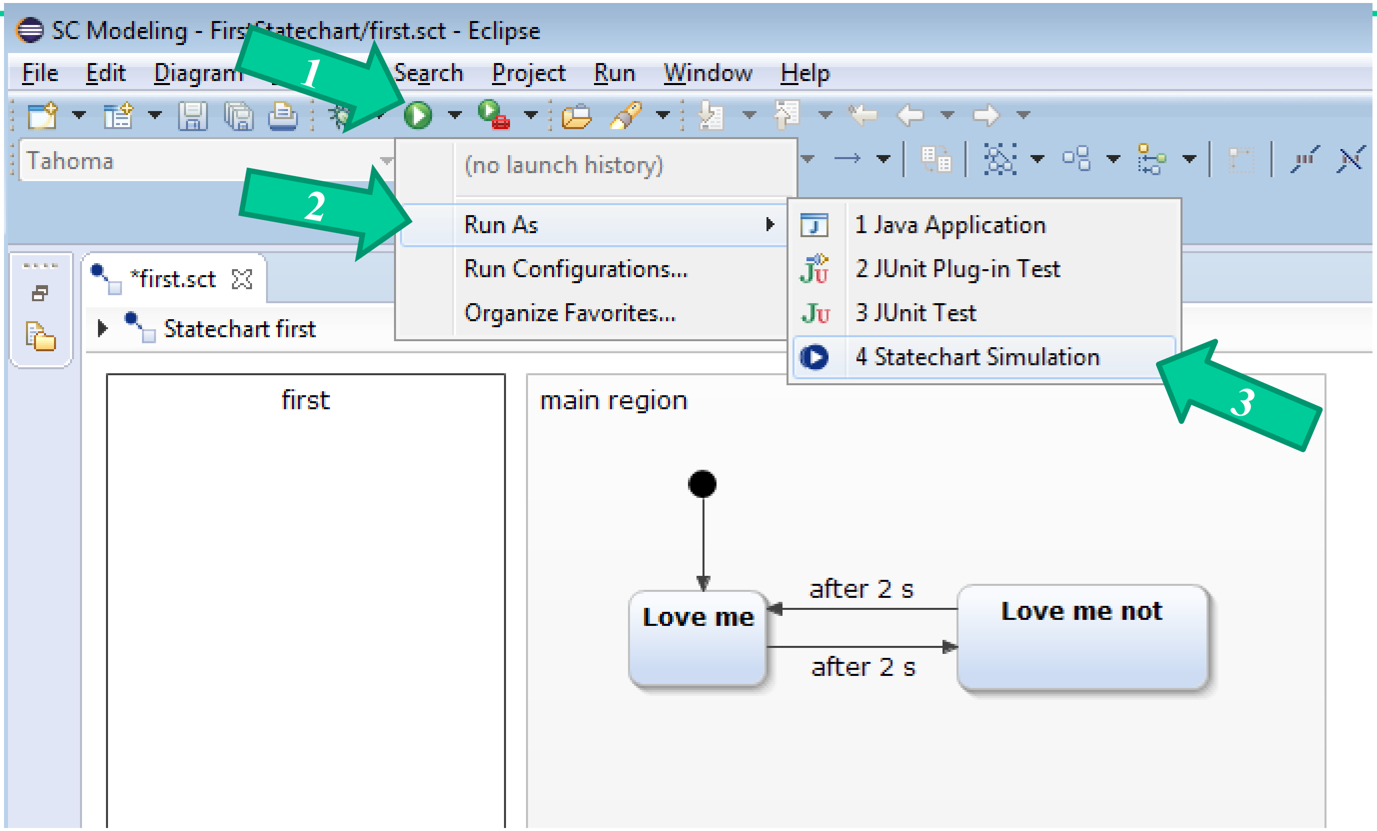
Simulation

Running a simulation (1/3)



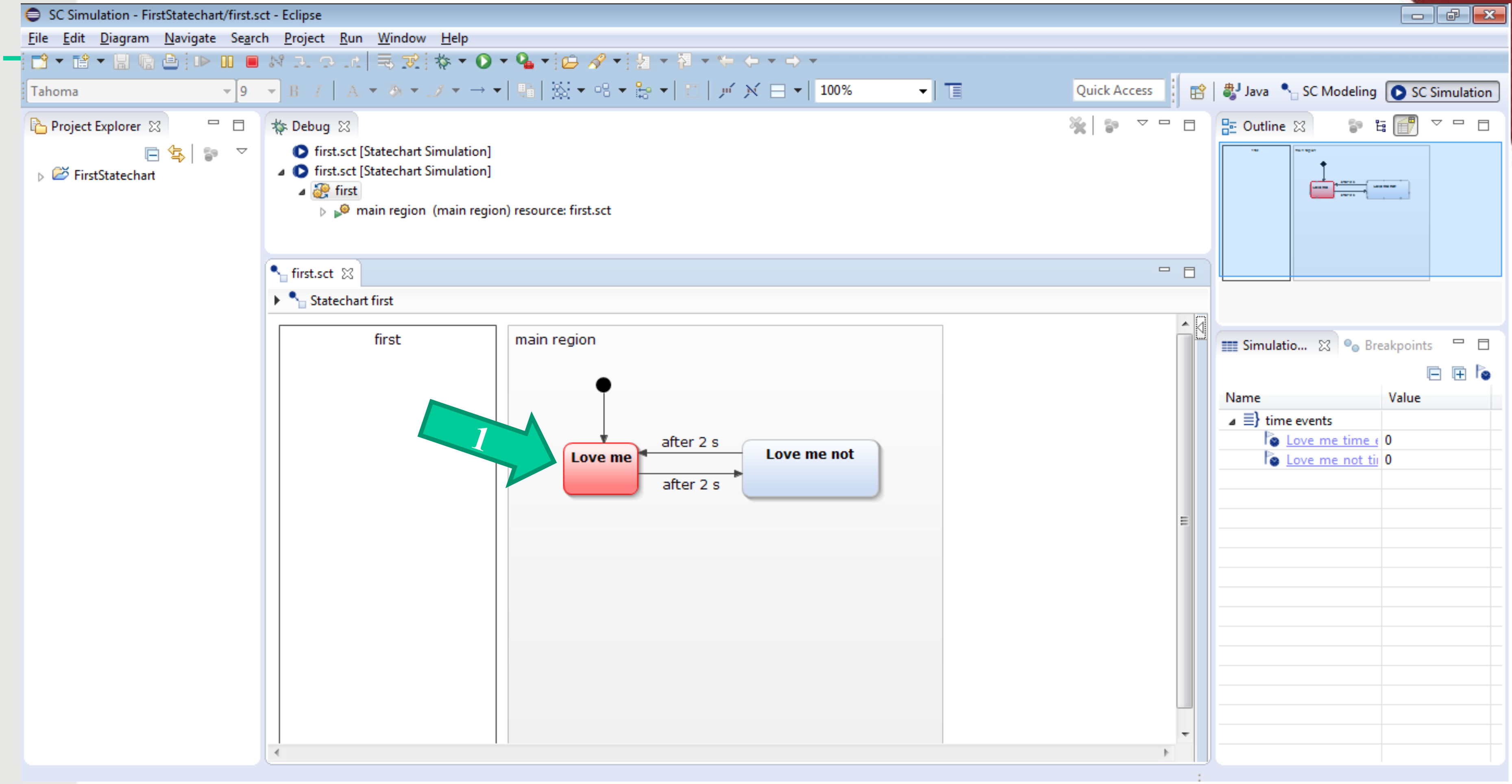
Create a statechart

Running a simulation (2/3)



In the Run menu (1), select “Run As” (2), “Statechart Simulation (3)

Running a simulation (3/3)



SC Simulation - FirstStatechart/first.sct - Eclipse

Project Explorer:
- FirstStatechart

Debug:
- first.sct [Statechart Simulation]
- first.sct [Statechart Simulation]
  - first
    - main region (main region) resource: first.sct

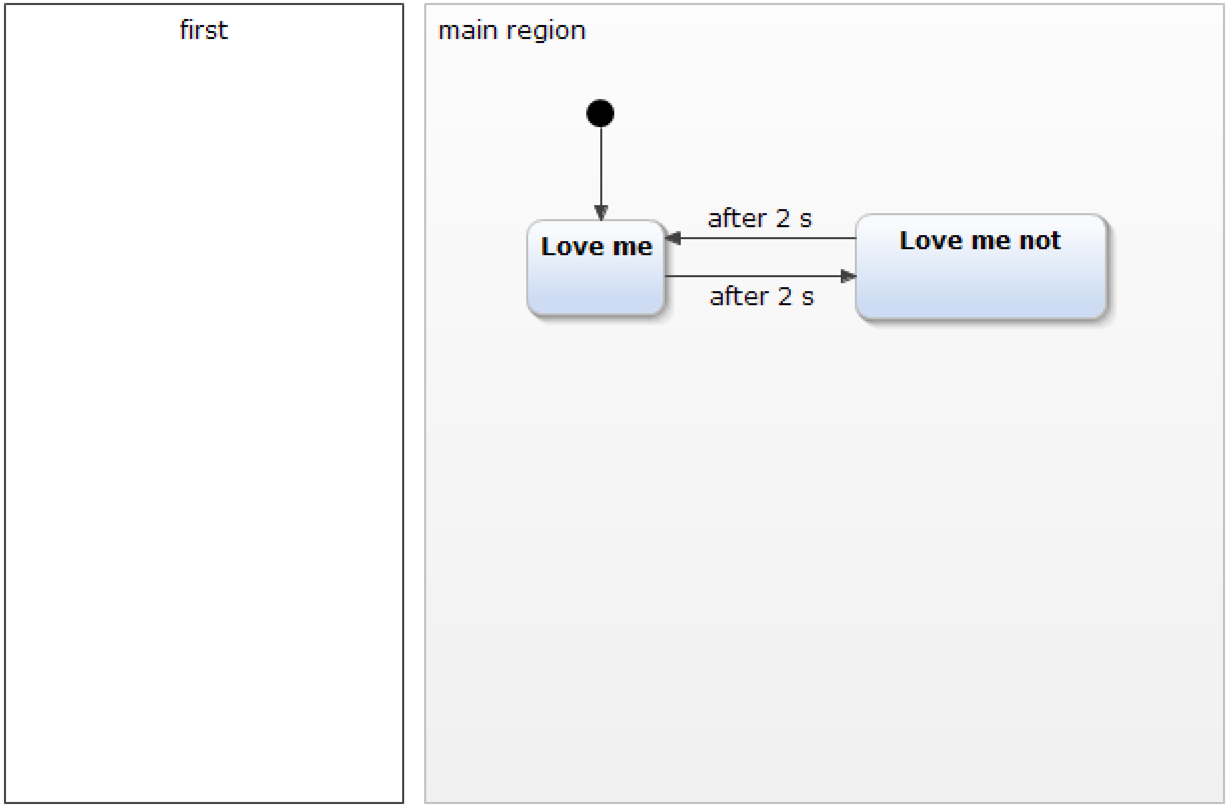
first.sct — Statechart first

Name	Value
time events	
Love me time e	0
Love me not ti	0

The tool will change to the “SC Simulation” perspective
Active states are highlighted in red (1)

Practice 1

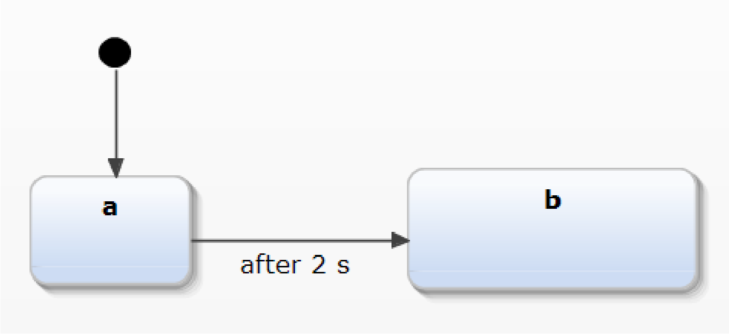
Create this statechart and simulate its execution



Events

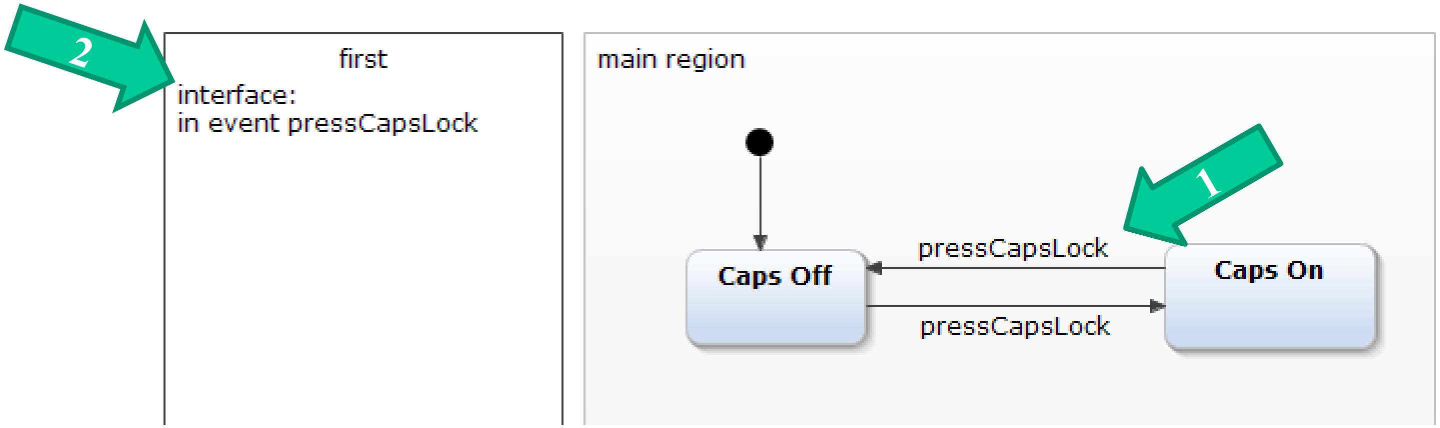
After

- Syntax: after *time unit*
- Unit:
  - *s* – seconds
  - *ms* – milliseconds
  - *us* – microseconds
  - *ns* – nanoseconds
  - empty – implies seconds



Custom Events

- You can write any event in your transitions (1)
  - But you need to declare the events (2)



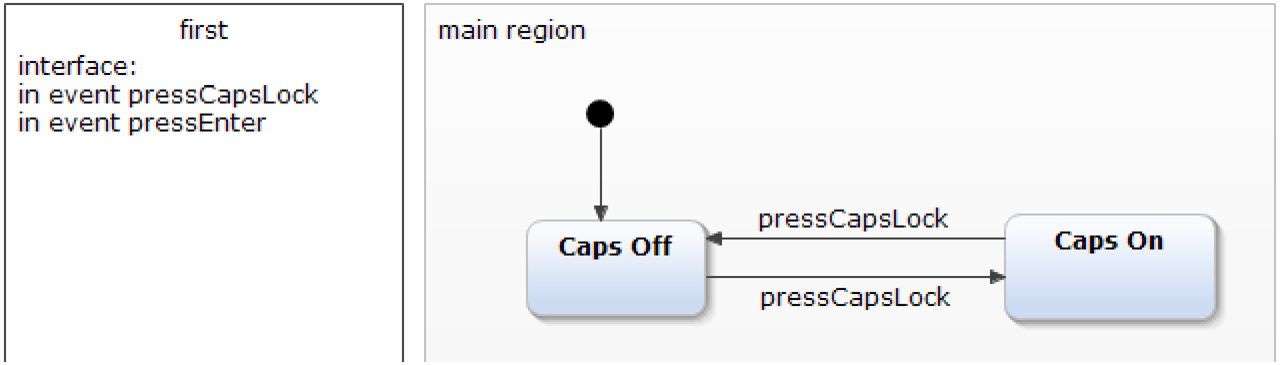
first

interface:
in event pressCapsLock

Defining events (general)

- You can define general events

```
interface:
in event pressCapsLocks
in event pressEnter
in event ...
```



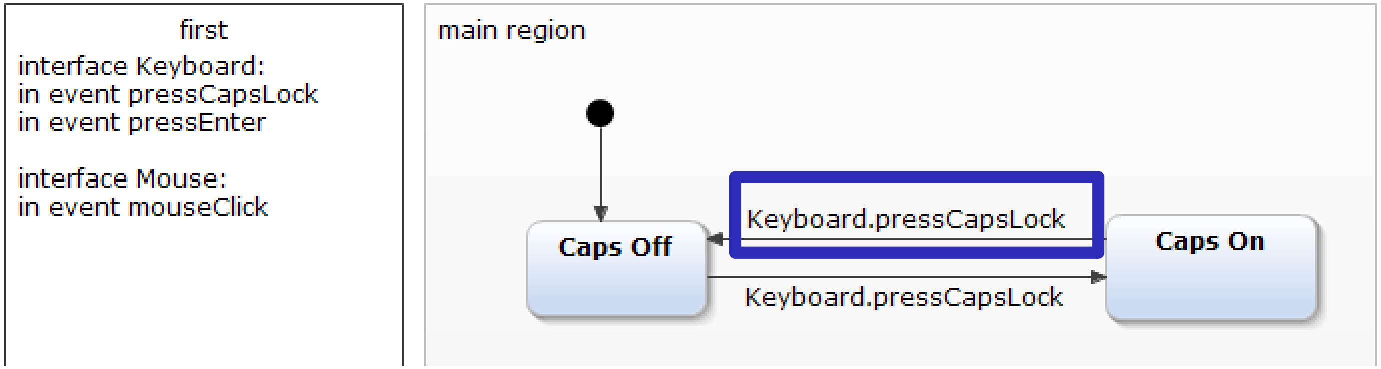
first

```
interface:
in event pressCapsLock
in event pressEnter
```

Defining events (scoped)

- Or you can define scoped events

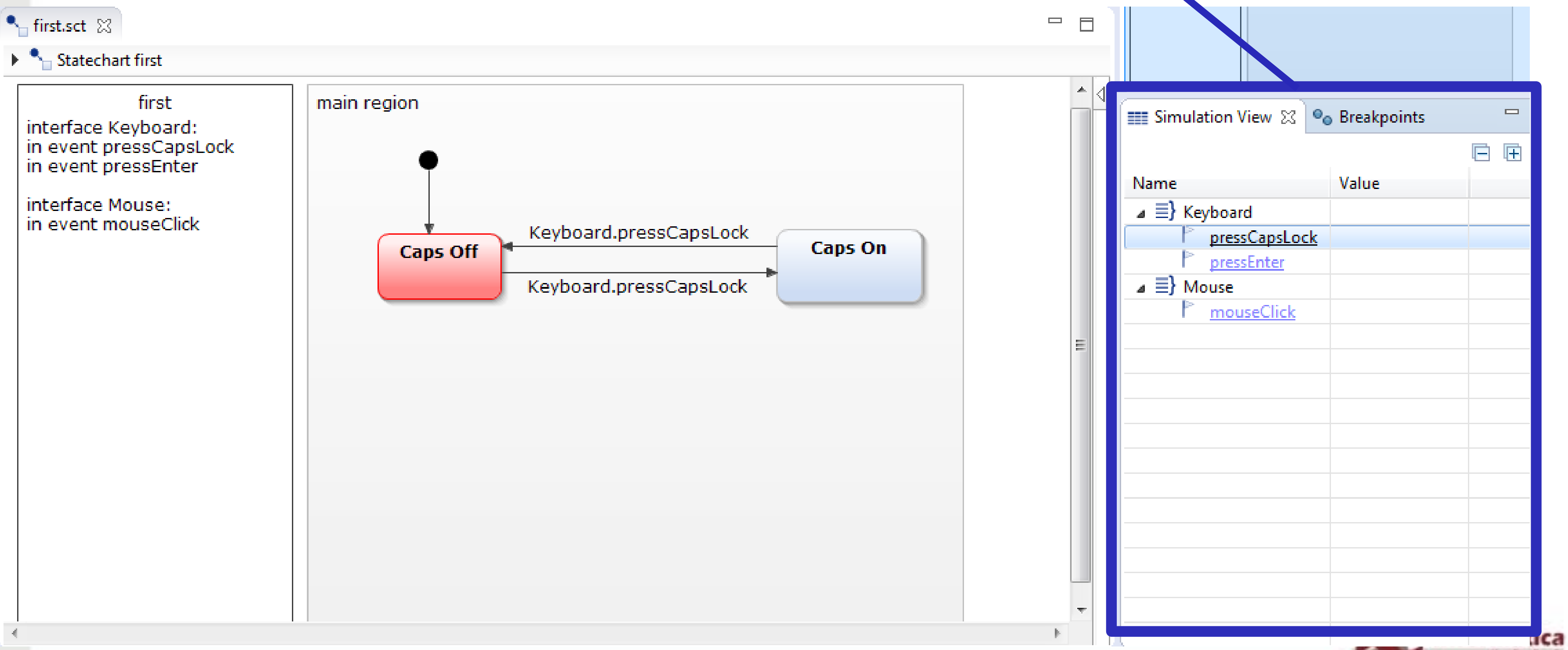
```
interface Keyboard:
in event pressCapsLocks
in event pressEnter
in event ...
```



```
first
interface Keyboard:
in event pressCapsLock
in event pressEnter

interface Mouse:
in event mouseClick
```

Events in a simulation

During simulation, the declared events appear in a list of events, which can be clicked to simulate the occurrence of that event



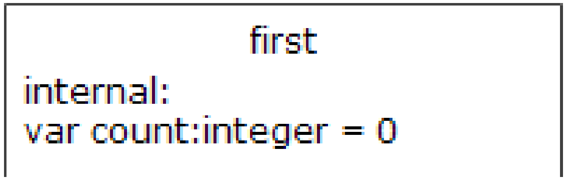
```
first
interface Keyboard:
in event pressCapsLock
in event pressEnter

interface Mouse:
in event mouseClick
```

Variables and Actions

Variables (declaring 1/2)

```
internal:
var varName:varType = startingValue
```

Ex: `var count:integer = 0`



first

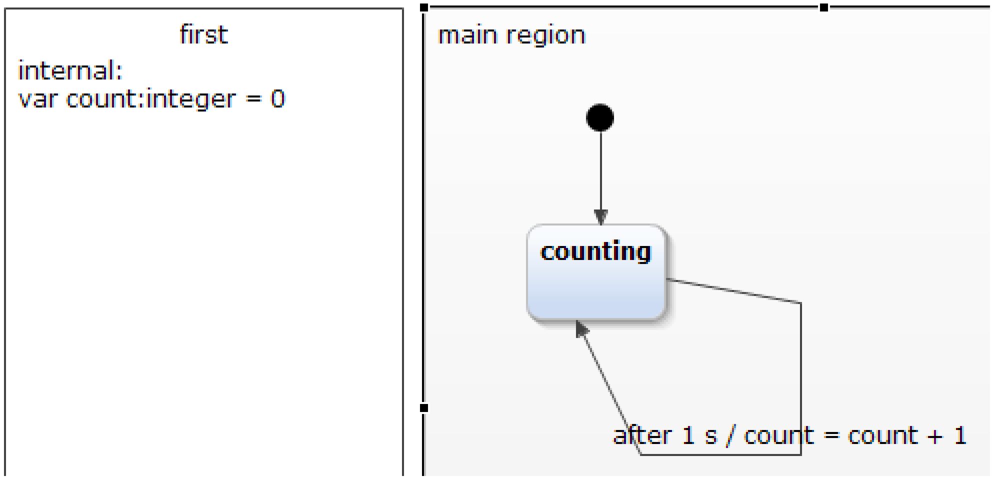
internal:
var count:integer = 0

Variables (declaring 2/2)

- Possible types:
  - integer
  - real
  - boolean
  - string

Variables (modifying)

- Variable can be modified by actions

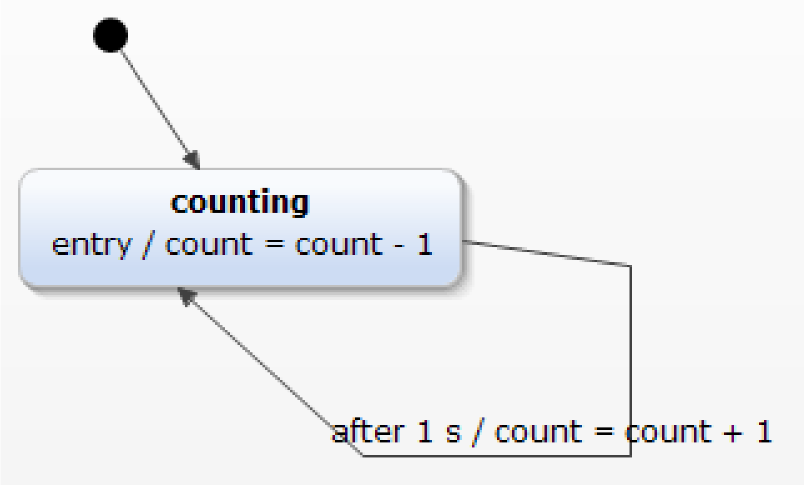


first

```
internal:
var count:integer = 0
```

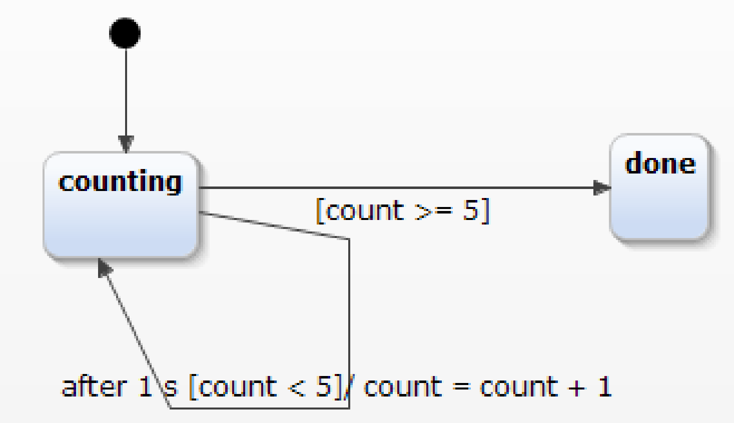
Actions

- Transition
  - event [condition] / action
- State
  - entry / action
  - exit / action



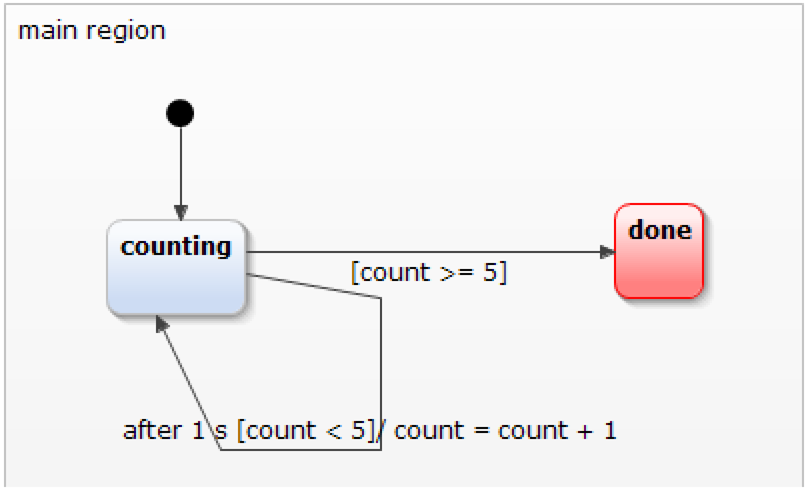
Variables (conditions)

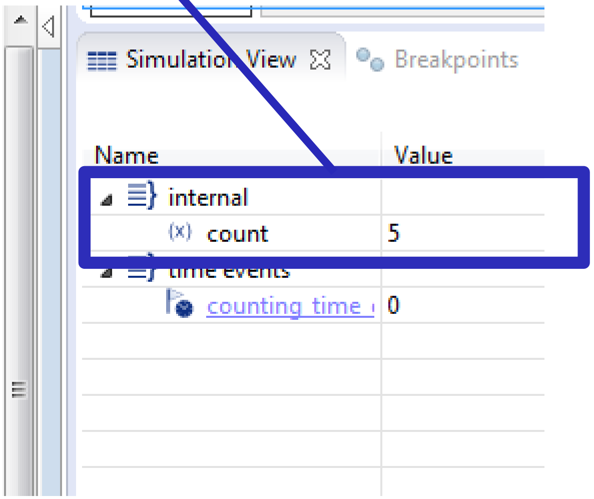
- Variables can also be used to define conditions
  - event [condition] / action



Variables (simulation)

During simulation, the current value of variables is also displayed in the "Simulation View"



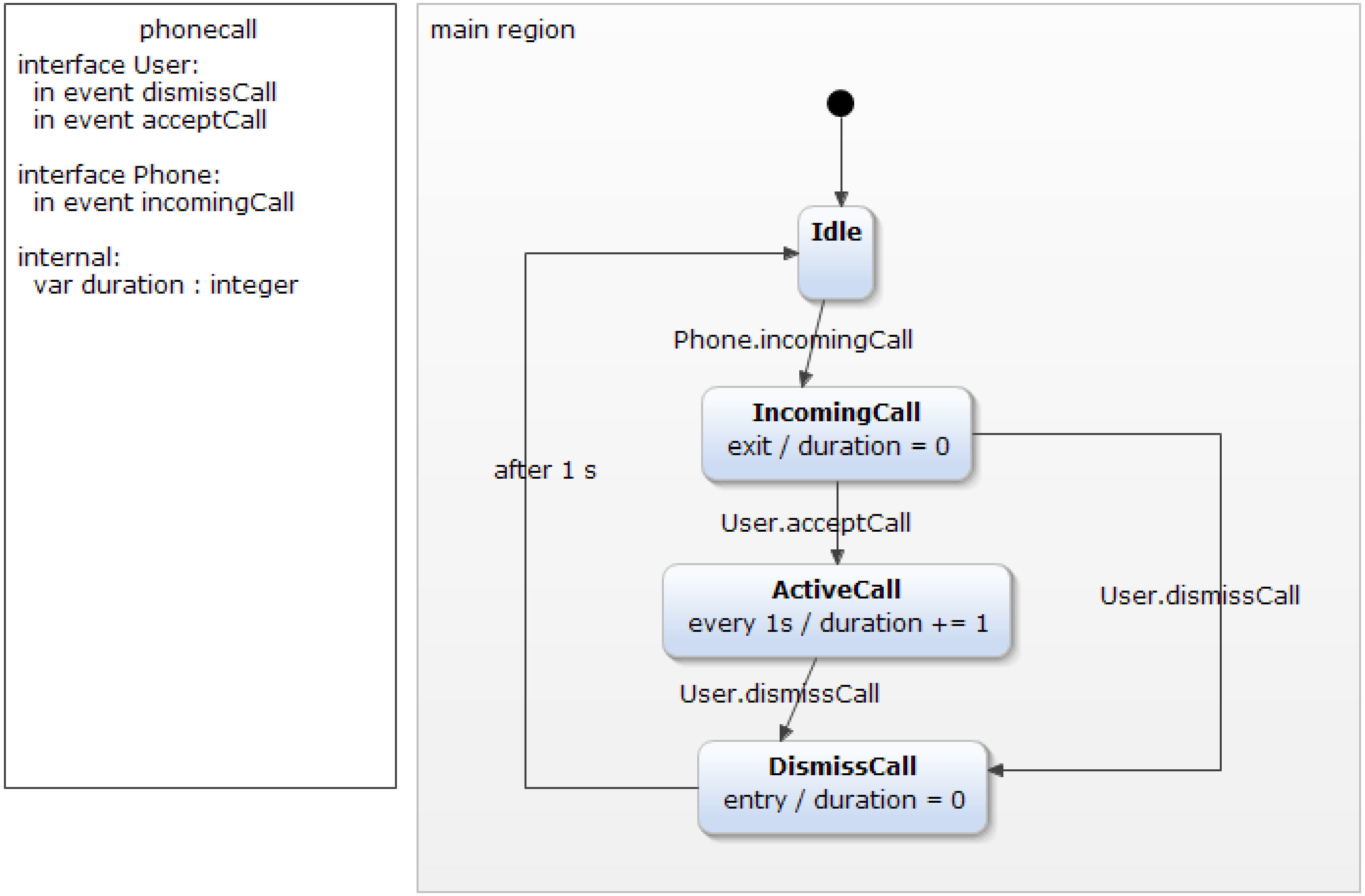


Name	Value
internal	
count	5
time events	
counting time	0

Variables and Actions

Practice 2

Create this statechart and simulate its execution



```
phonecall
interface User:
  in event dismissCall
  in event acceptCall

interface Phone:
  in event incomingCall

internal:
  var duration : integer
```

Practice 3

Create the statechart for a traffic light, and simulate its execution