How to Generate Code from State Machine Diagram?

Written Date : June 24, 2015

A state machine consists of a number of states and the transition between states. To create a state machine, you start by creating a controller class, and then create a sub-state machine diagram from the controller class. Moreover, you can generate source code based on the sub-state machine diagram.

Overview of this Tutorial

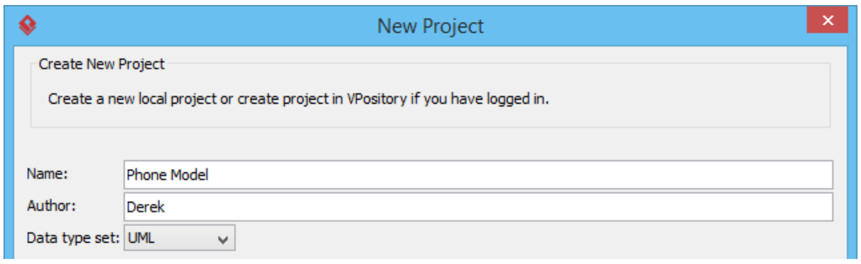
In this tutorial, we will show you how to model a controller class and its state machine. At the end, you will generate state machine code and play with the sample application. You will also export SCXML from your state machine.

In order to complete this tutorial you must have Visual Paradigm installed. You also need to have basic knowledge in UML modeling with Visual Paradigm.

Create a Project for This Tutorial

In order not to mess up your production data, we will create a new project for this tutorial. In this section, you are going to create such a project.

1. Select **Project > New** from the toolbar.
2. Enter *Phone Model* as project name.

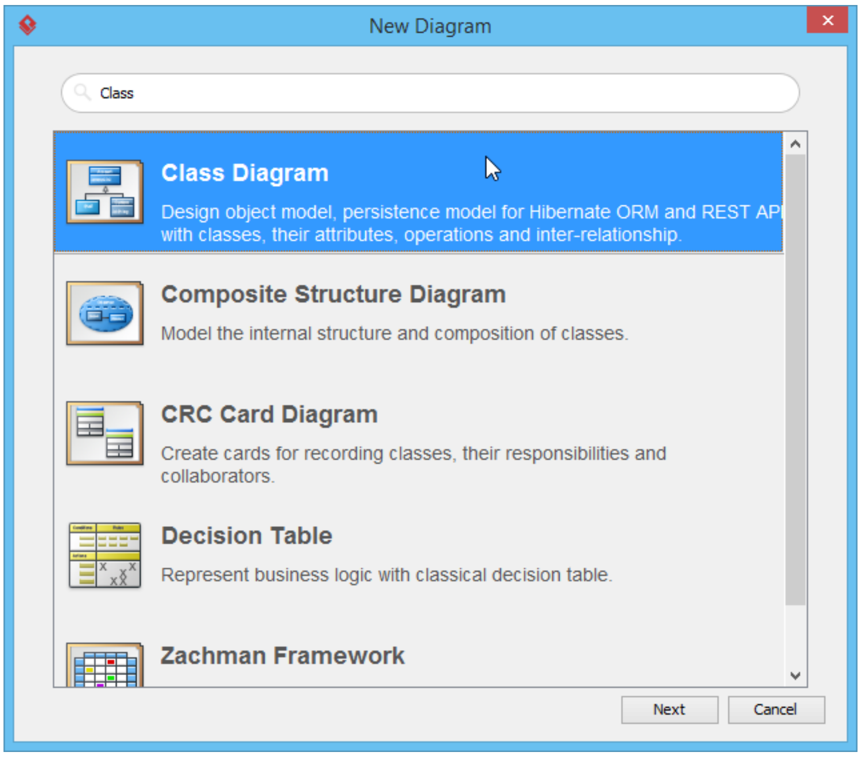

New Project
Create New Project
Create a new local project or create project in VPository if you have logged in.
Name: Phone Model
Author: Derek
Data type set: UML

3. Click **Create Blank Project** to confirm the creation.

Creating State Machine

1. Create a class diagram first. Select **Diagram > New** from the toolbar.

2. In the **New Diagram** window, select **Class Diagram** and click **Next**.



New Diagram

Class

Class Diagram
Design object model, persistence model for Hibernate ORM and REST API with classes, their attributes, operations and inter-relationship.

Composite Structure Diagram
Model the internal structure and composition of classes.

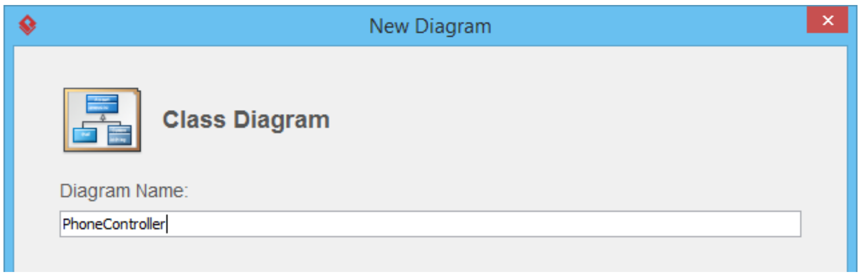
CRC Card Diagram
Create cards for recording classes, their responsibilities and collaborators.

Decision Table
Represent business logic with classical decision table.

Zachman Framework

Next | Cancel

3. Enter *PhoneController* as diagram name.

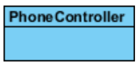


New Diagram

Class Diagram

Diagram Name: PhoneController

4. Click **OK** to confirm the creation of class diagram.
5. Draw a *PhoneController* class in the class diagram.

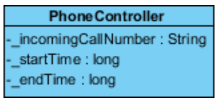


6. Add the following attributes into *PhoneController*. You can add attribute by right clicking on the class and selecting **Add > Attribute** from the popup menu.

Name	Type
_incomingCallNumber	String

_startTime	long
_endTime	long

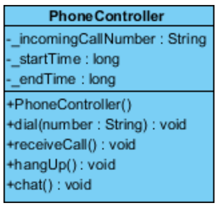
The class should look like this:



7. Add operations to the class. These operations will trigger state change. To add operation, right-click on the class and select **Add > Operation** from the pop-up menu.

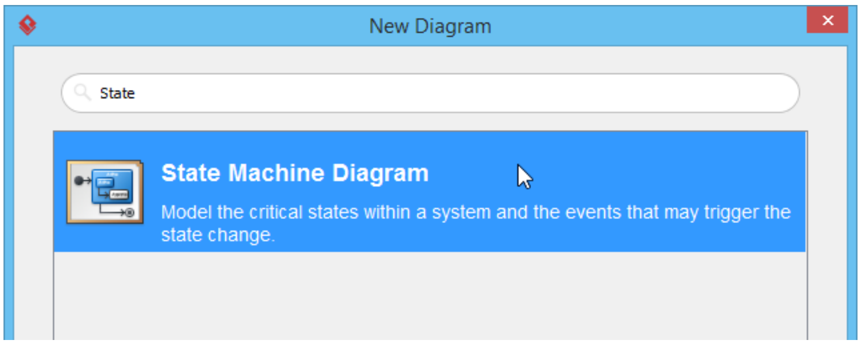
Name	Return Type
PhoneController	
dial(number : String)	void
receiveCall	void
hangUp	void
chat	void

The class should look like this:



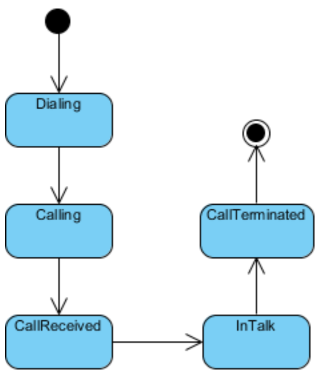
8. Now, we are going to draw the state machine for *PhoneController* class. Right-click on *PhoneController* and select **Sub Diagram > New Diagram...** from the popup menu.

9. Select **State Machine Diagram** and click **Next**.

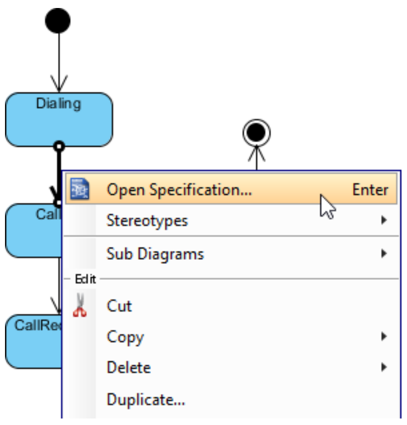

New Diagram
State
State Machine Diagram
Model the critical states within a system and the events that may trigger the state change.

10. Keep the diagram name as-is and click **OK** to confirm diagram creation.

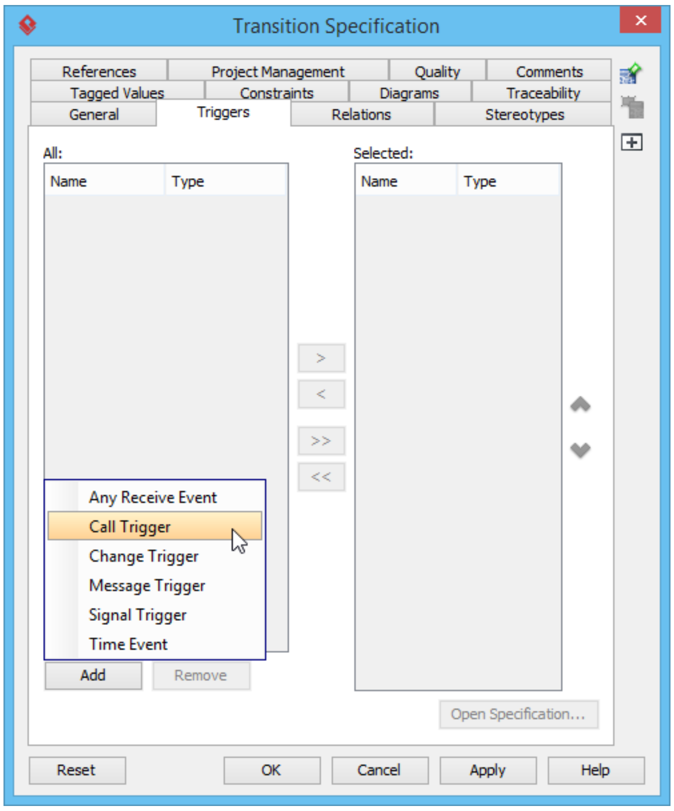
11. A state machine diagram is created with an initial node appears. Complete the diagram by drawing the states show in the following diagram.



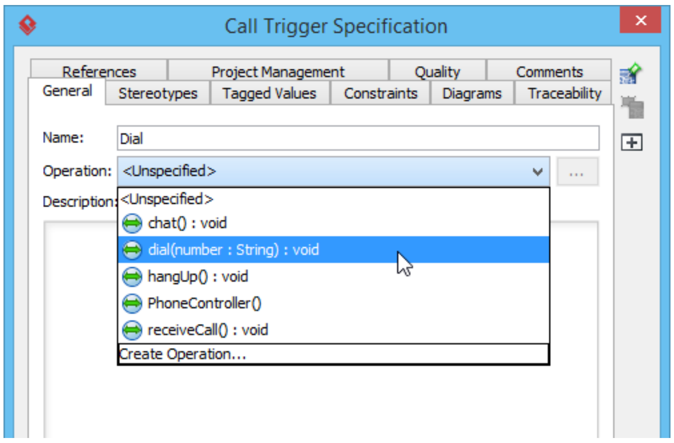
12. Now, add a trigger to transitions. Right-click on the transition between *Dialing* state and *Calling* state. Select **Open Specification...** from the pop-up menu.



13. In the **Transition Specification** window, open **Triggers** tab. Click **Add** and select **Call Trigger** from the pop-up menu.



14. In the **Call Trigger Specification** window, enter *Dial* as trigger name. Select *dial(number : String) : void* from the drop down menu of **Operation**.



Name: Dial
Operation: <Unspecified>

15. Click **OK**.

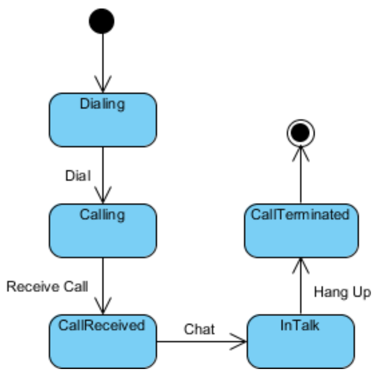
16. The trigger is selected for the transition.

17. Click **OK**.

18. Continue to add a few more triggers following the table below:

Transition	Trigger Name
Calling -> CallReceived	Receive Call
CallReceived -> InTalk	Chat
InTalk -> CallTerminated	Hang Up

The completed state machine diagram is shown as follows:

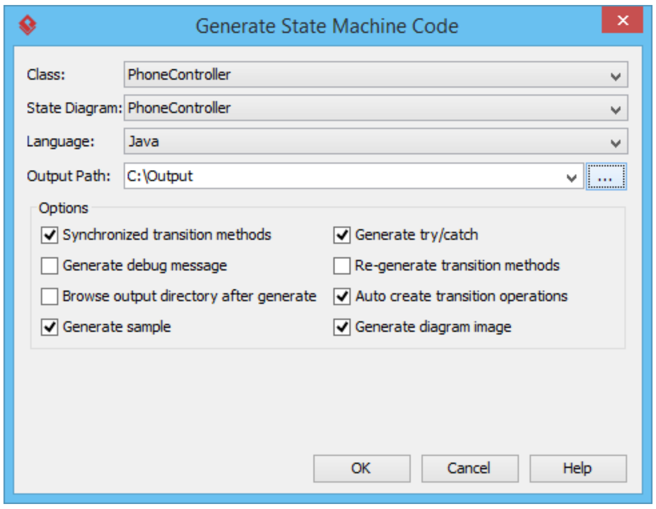


Generating State Machine Code

Now, let's generate state machine code from the project.

1. Select **Tools > Code > Generate State Machine Code** from the toolbar.

2. In the **Generate State Machine Code** window, specify the directory to store the generated source file.

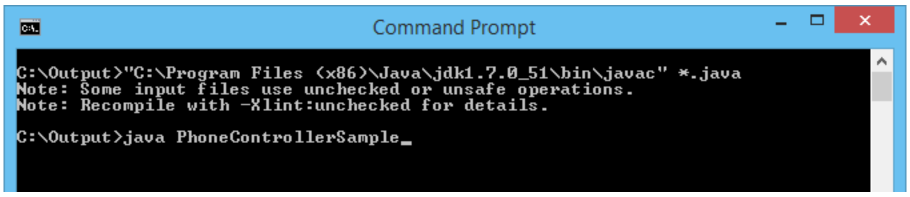

Generate State Machine Code

Class: PhoneController
State Diagram: PhoneController
Language: Java
Output Path: C:\Output

Options
- [x] Synchronized transition methods
- [x] Generate try/catch
- [ ] Generate debug message
- [ ] Re-generate transition methods
- [ ] Browse output directory after generate
- [x] Auto create transition operations
- [x] Generate sample
- [x] Generate diagram image

3. Click **OK**.

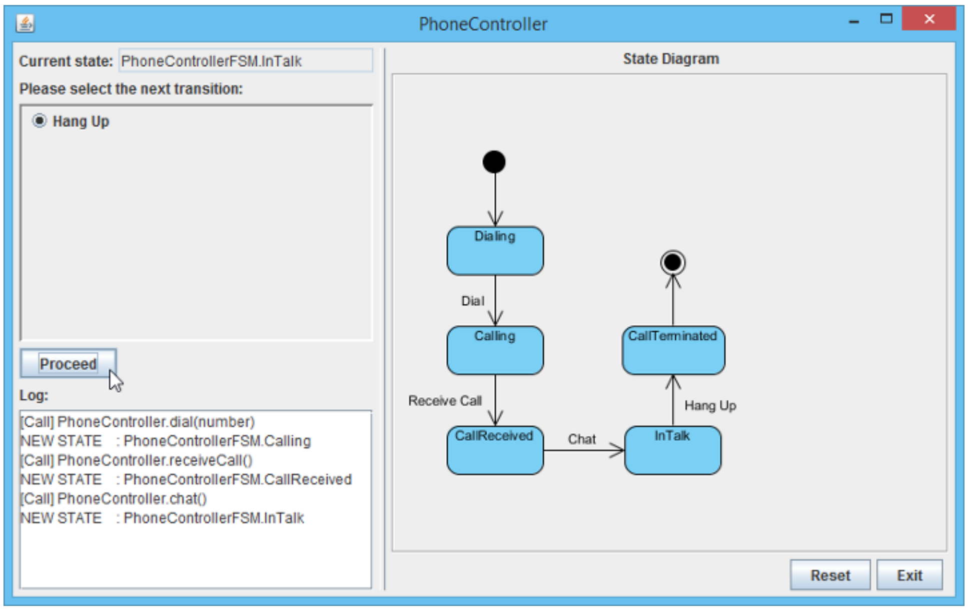
4. Compile the generated code and run the **PhoneControllerSample** class.



```
C:\Output>"C:\Program Files (x86)\Java\jdk1.7.0_51\bin\javac" *.java
Note: Some input files use unchecked or unsafe operations.
Note: Recompile with -Xlint:unchecked for details.

C:\Output>java PhoneControllerSample_
```

Run the sample application by clicking **Proceed** repeatedly and observe the change of states.



Current state: PhoneControllerFSM.InTalk

Log:

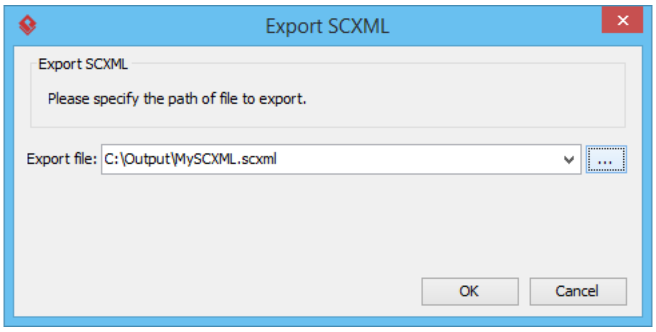
```
[Call] PhoneController.dial(number)
NEW STATE   : PhoneControllerFSM.Calling
[Call] PhoneController.receiveCall()
NEW STATE   : PhoneControllerFSM.CallReceived
[Call] PhoneController.chat()
NEW STATE   : PhoneControllerFSM.InTalk
```

Generating SCXML

Now, let's generate SCXML from your state machine.

1. Right-click on the background of your state machine diagram and select **Export ^gt; Export to SCXML...** from the popup menu.

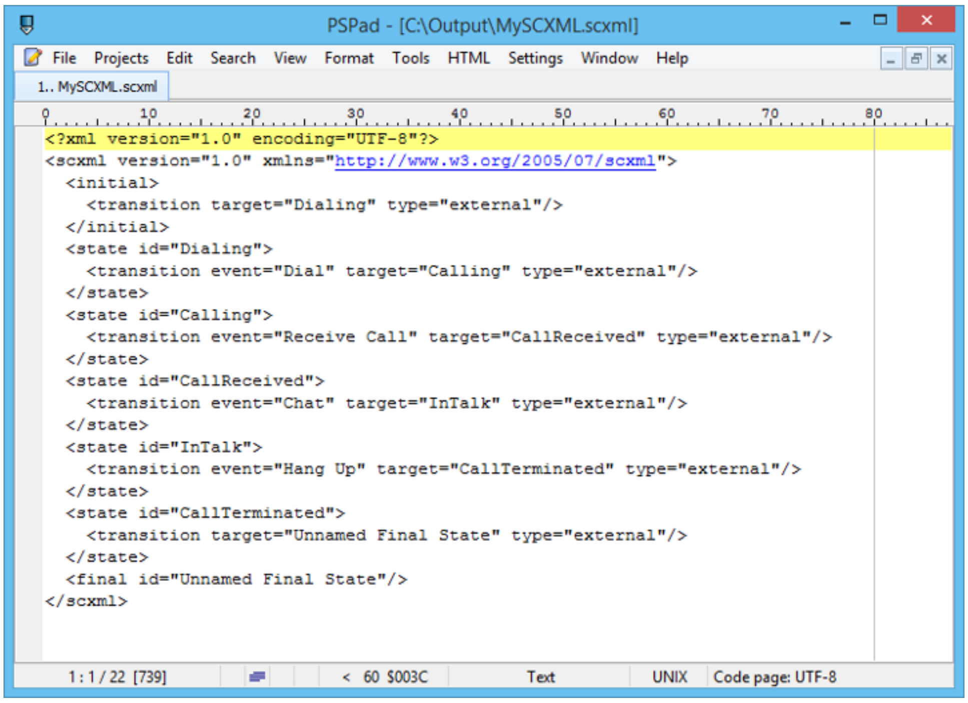
2. In the **Export SCXML** dialog box, specify the filepath of the *.scxml file.



Please specify the path of file to export.

Export file: C:\Output\MySCXML.scxml

3. Click **OK**. The exported file should look like this one.



```
<?xml version="1.0" encoding="UTF-8"?>
<scxml version="1.0" xmlns="http://www.w3.org/2005/07/scxml">
  <initial>
    <transition target="Dialing" type="external"/>
  </initial>
  <state id="Dialing">
    <transition event="Dial" target="Calling" type="external"/>
  </state>
  <state id="Calling">
    <transition event="Receive Call" target="CallReceived" type="external"/>
  </state>
  <state id="CallReceived">
    <transition event="Chat" target="InTalk" type="external"/>
  </state>
  <state id="InTalk">
    <transition event="Hang Up" target="CallTerminated" type="external"/>
  </state>
  <state id="CallTerminated">
    <transition target="Unnamed Final State" type="external"/>
  </state>
  <final id="Unnamed Final State"/>
</scxml>
```

PSPad - [C:\Output\MySCXML.scxml]
File Projects Edit Search View Format Tools HTML Settings Window Help
1.. MySCXML.scxml
1 : 1 / 22 [739]
< 60 $003C
Text
UNIX
Code page: UTF-8

Resources

1. Phone Model.vpp

Related Links

- Code Engineering features in Visual Paradigm
- State Machine Diagram feature description

Visual Paradigm

Visual Paradigm home page
(https://www.visual-paradigm.com/)

Visual Paradigm tutorials
(https://www.visual-paradigm.com/tutorials/)