Singleton Pattern Tutorial

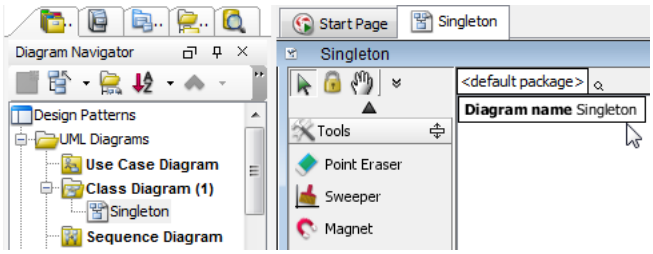
Written Date : September 30, 2009

This tutorial is aimed to guide the definition and application of Gang of Four (GoF) singleton design pattern. By reading this tutorial, you will know how to develop a model for the signletion pattern, and how to apply it in practice.

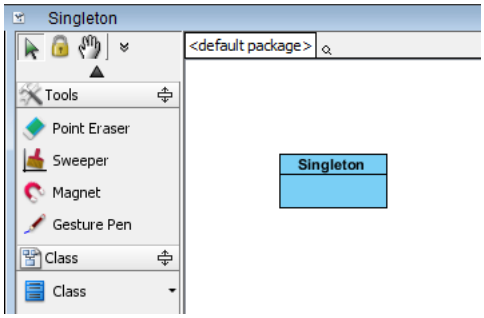
Modeling Design Pattern with Class Diagram

1. Create a new project *Design Patterns*.

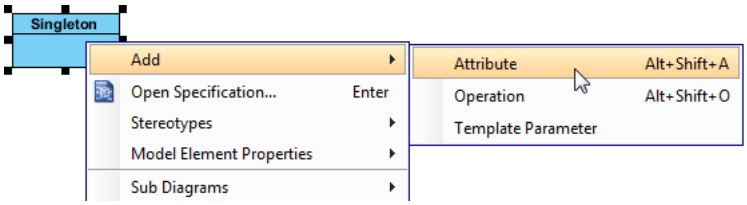
2. Create a class diagram *Singleton*.



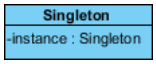
3. Select **Class** from diagram toolbar. Click on the diagram to create a class. Name it as *Singleton*.



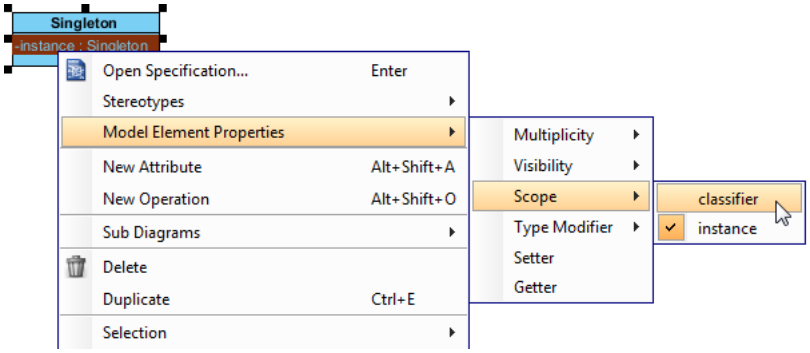
4. Right click on the *Singleton* class and select **Add** > **Attribute** from the popup menu.



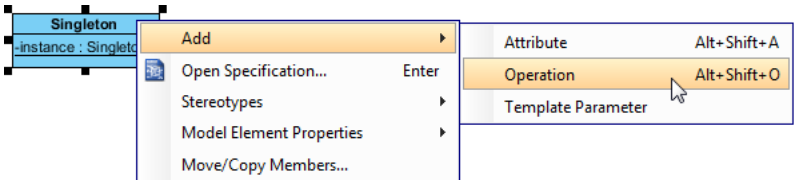
5. Name the attribute *instance*. Set its type as *Singleton*.



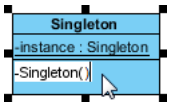
6. The attribute instance need to be static. Right click on the attribut and select **Model Element Properties** > **Scope** > **Classifier** from the popup menu.



7. Create constructor for the *Singleton* class. Right click on *Singleton* and select **Add** > **Operation** from the popup menu.

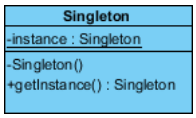


8. Name the operation *Singleton*, which follows the *Singleton* class's name. Change + to - in front of the operation name to indicate that this is a private constructor.

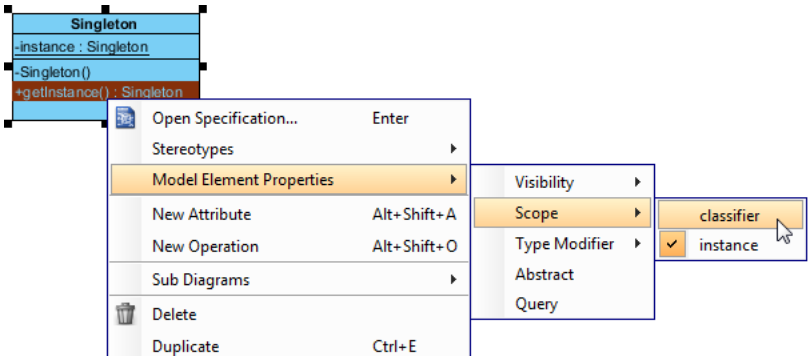


9. Right click on *Singleton* and select **Add** > **Operation** from the popup menu.

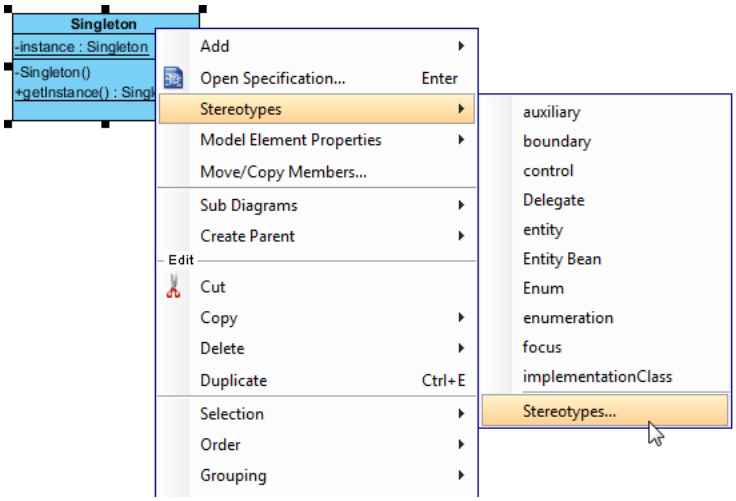
10. Name the operation *getInstance*, and make it return *Singleton*.



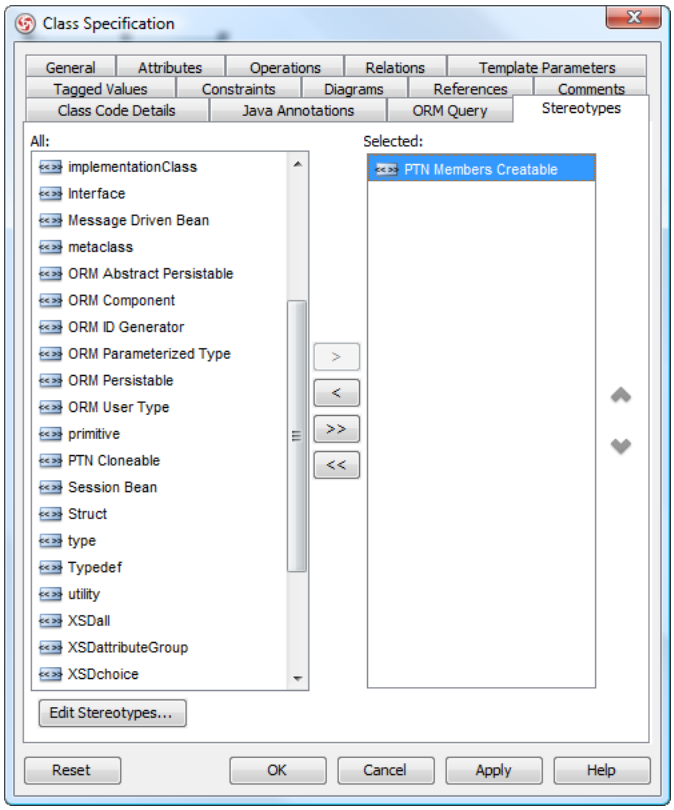
11. The operation *getInstance* need to be static. Right click on the operation and select **Model Element Properties** > **Scope** > **Classifier** from the popup menu.



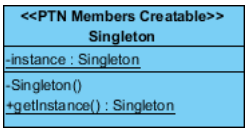
12. In practice, there may be operations for accessing data in the Singleton class. To represent this, stereotype the *Singleton* class as PTN Members Creatable. Right click on the *Singleton* class and select **Stereotypes** > **Stereotypes...** from the popup menu.



13. In the class specification dialog box, select **PTN Members Creatable** and click > to assign it. Click **OK** to confirm.

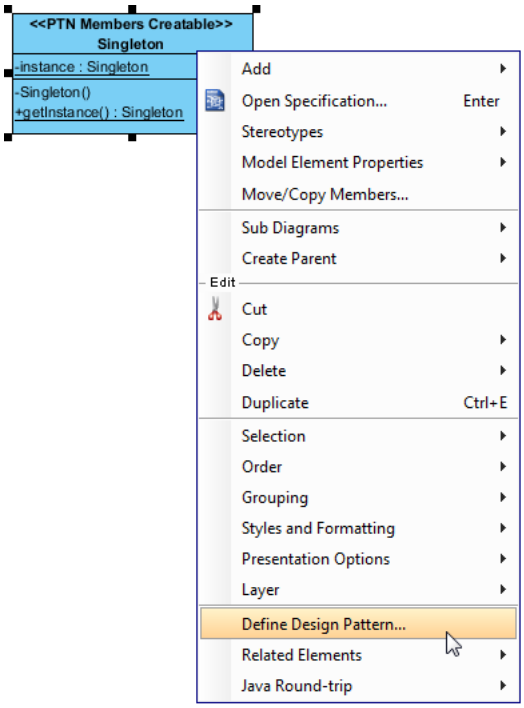


Up to now, the diagram should look like this:

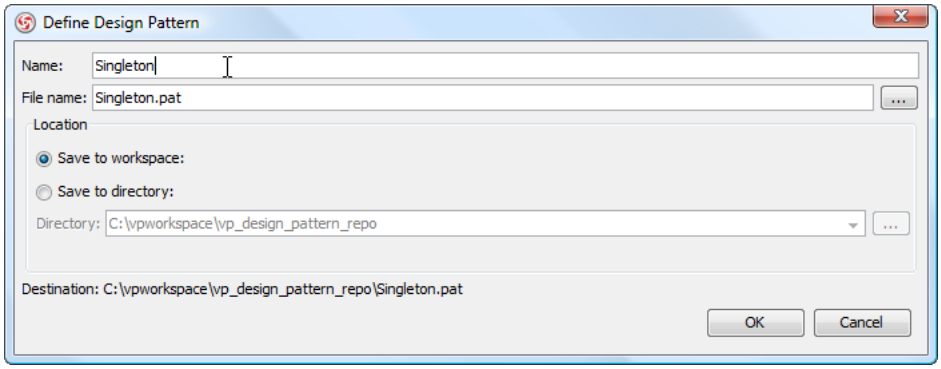


Defining Pattern

1. Right click on the Singleton class and select **Define Design Pattern...** from the popup menu.



2. In the **Define Design Pattern** dialog box, specify the pattern name *Singleton*. Keep the file name as is. Click **OK** to proceed.

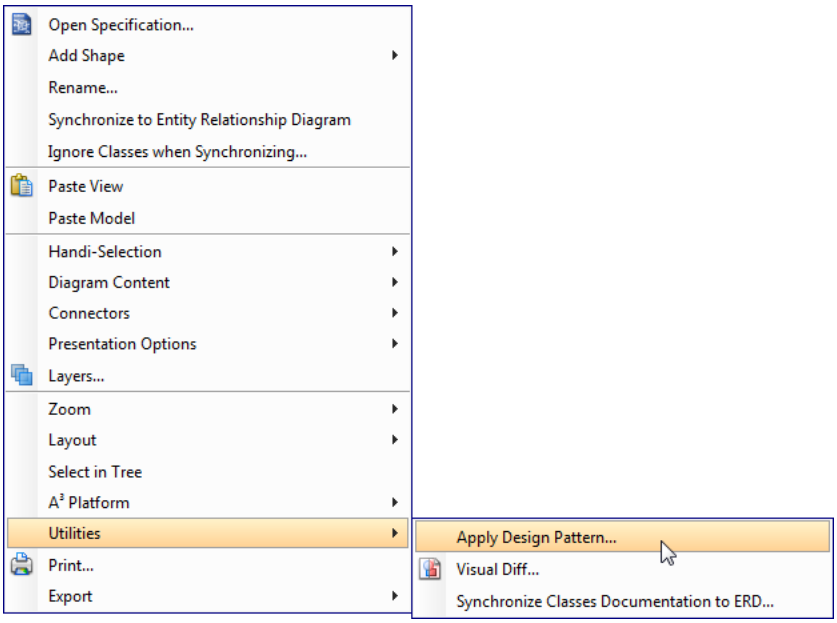


Applying Design Pattern on Class Diagram

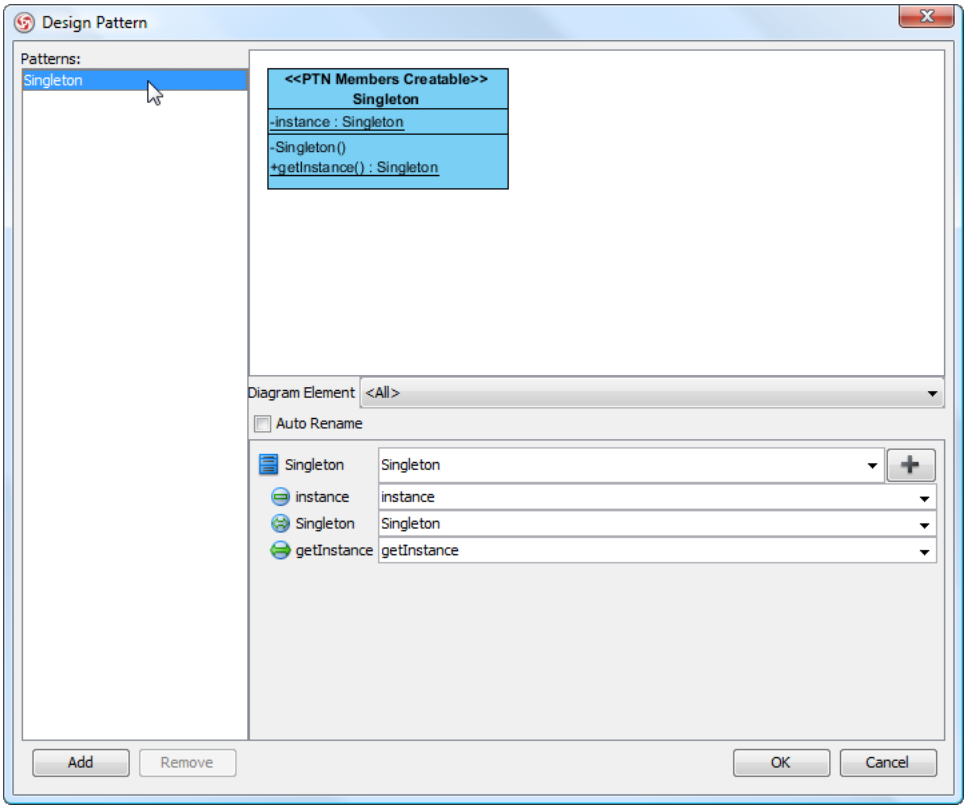
In this section, we are going to apply the singleton pattern in modeling a class registry.

1. Create a new project *Class Registry*.
2. Create a class diagram *The Registry*.

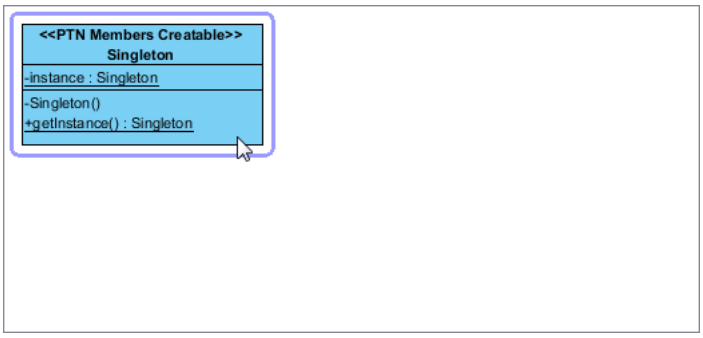
3. Right click on the class diagram and select **Utilities** > **Apply Design Pattern...** from the popup menu.



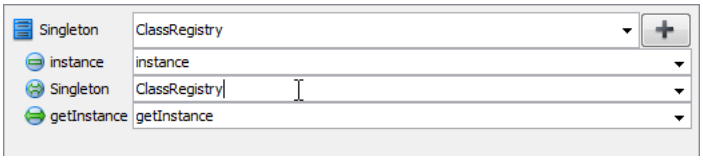
4. In the **Design Pattern** dialog box, select *Singleton* from the list of patterns.



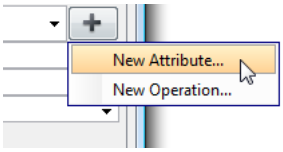
5. Click on *Singleton* in the ovewview.



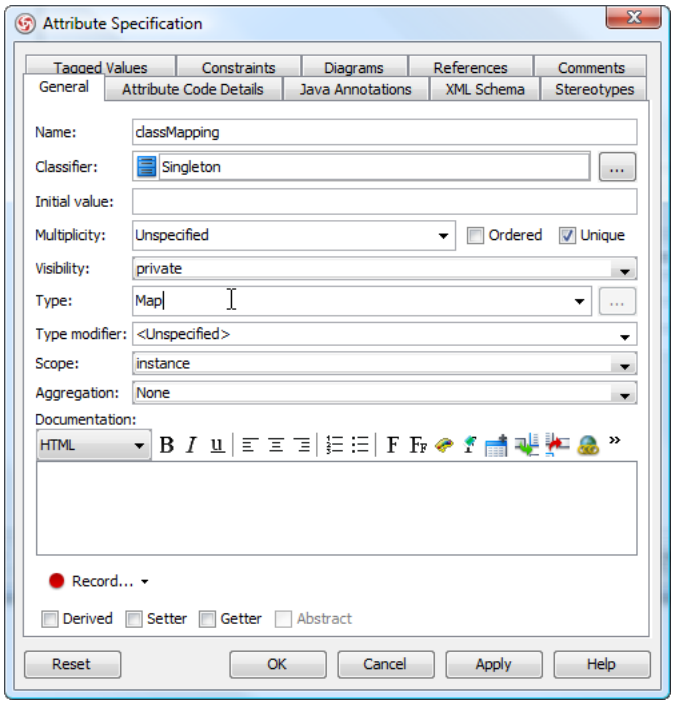
6. Rename the class *Singleton*, as well as the constructor to *ClassRegistry* at the bottom pane.



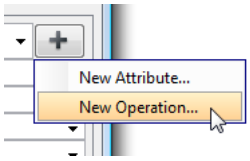
7. We need to add an attribute for holding the classes user register. Click on the + button and select **New Attribute...** from the popup menu.



8. In the **Attribute** Specification, enter *classMapping* as attribute name. Enter *Map* as type.

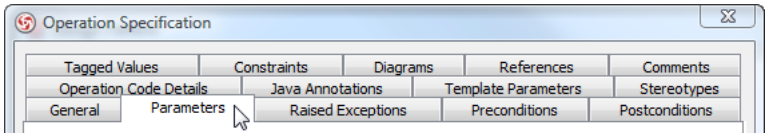


9. We need to add operations for registering class and retrieving class by type. Click on the + button and select **New Operation...** from the popup menu.



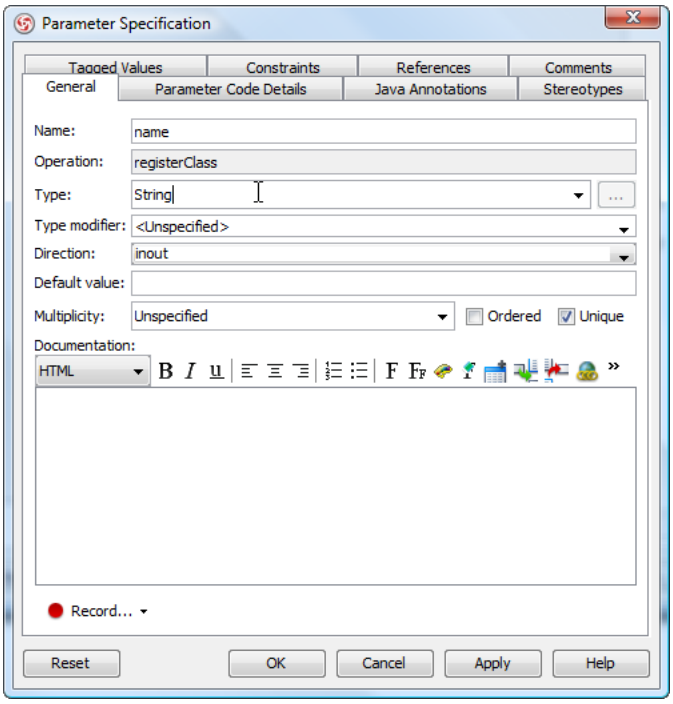
10. In the **Operation** Specification dialog box, enter *registerClass* as operation name.

11. Open the **Parameters** tab.

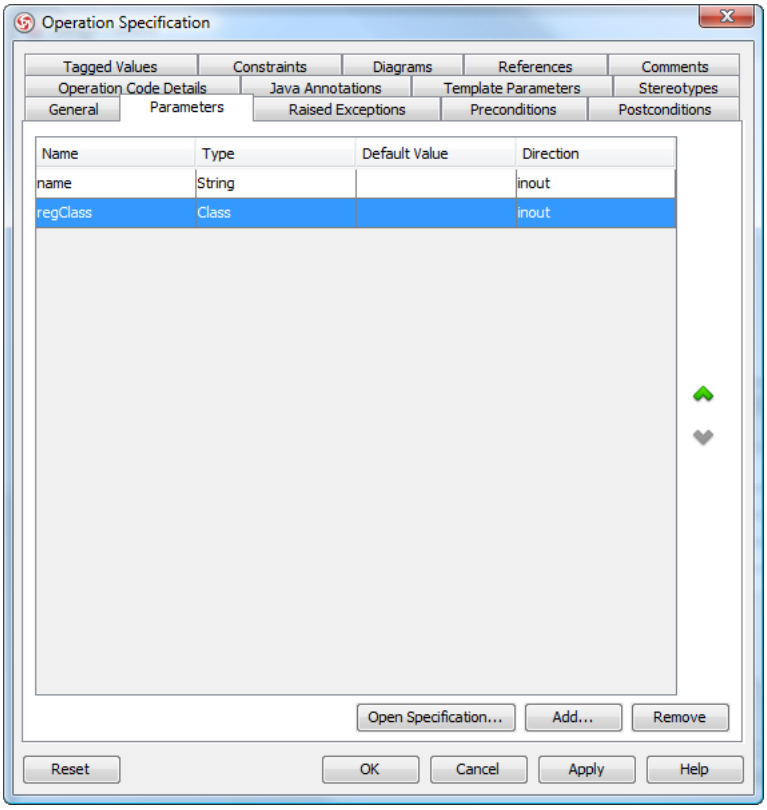


12. Click **Add...** at the bottom of specification dialog box.

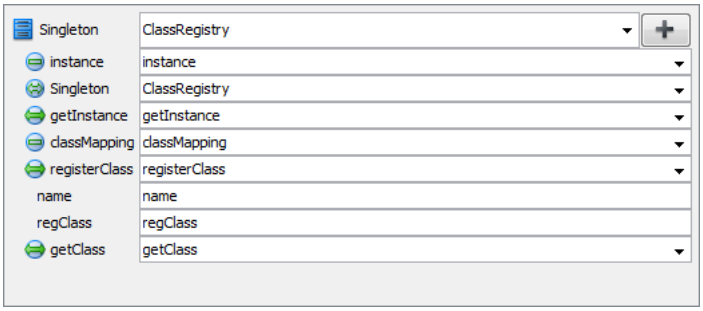
13. In the **Parameter** Specification dialog box, enter *name* as parameter name and set *String* as type.



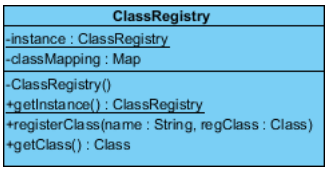
14. Repeat steps 12 and 13 to add parameter *regClass*, and set *Class* as type. Click **OK** to confirm.



15. Click on the + button and select **New Operation...** from the popup menu.
16. In the **Operation Specification** dialog box, enter *getClass* as name, and set *Class* as return type.



17. Click **OK** to apply the pattern to diagram. This is the result:



Resources

1. Design Patterns.vpp
2. Singleton.pat

Related Links

- Full set of UML tools and UML diagrams

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

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