Bridge Pattern Tutorial

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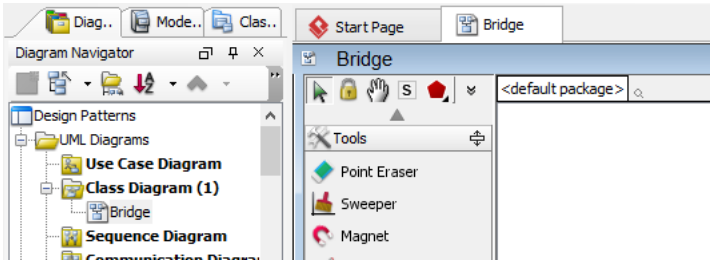
This tutorial is aimed to guide the definition and application of Gang of Four (GoF) bridge design pattern. By reading this tutorial, you will know how to develop a model for the bridge pattern, and how to apply it in practice.

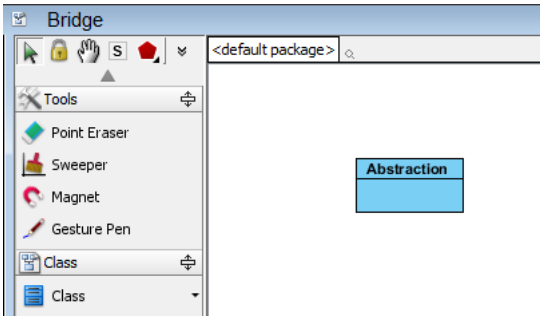
Modeling Design Pattern with Class Diagram

1. Create a new project *Design Patterns*.

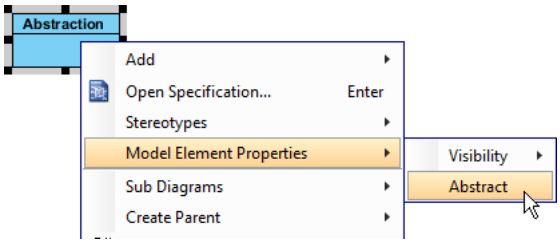
2. Create a class diagram *Bridge*.



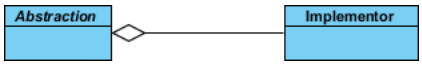
3. Select **Class** from diagram toolbar. Click on the diagram to create a class. Name it as *Abstraction*.



4. Right-click on *Abstraction*, and select **Model Element Properties** > **Abstract** to set it as abstract.

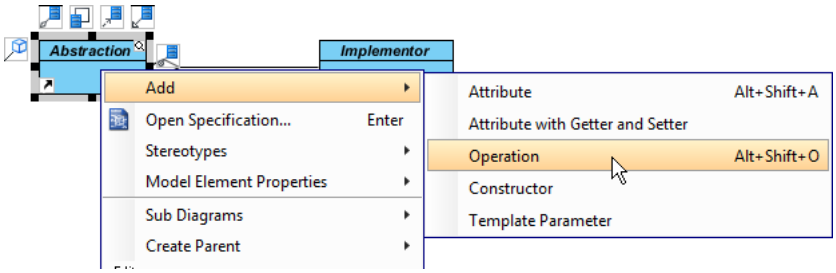


5. Move the mouse cursor over the *Abstraction* class, and drag out **Aggregation** > **Class** to create an associated class *Implementor*.



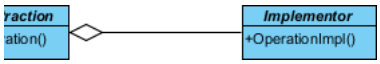
6. Right-click on *Implementor*, and select **Model Element Properties** > **Abstract** to set it as abstract.

7. Right-click on the *Abstract* class, and select **Add** > **Operation** from the popup menu.

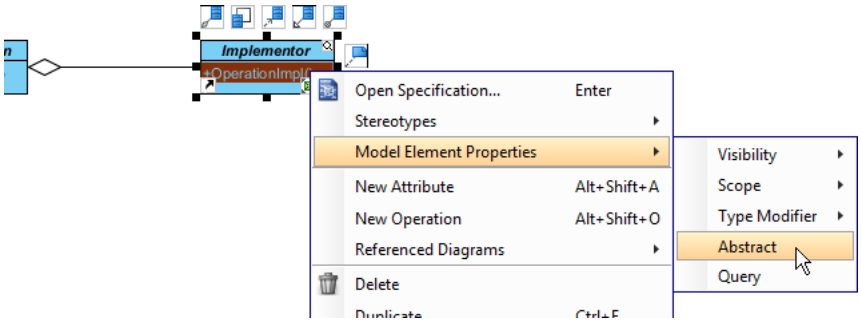


8. Name the operation *Operation()*.

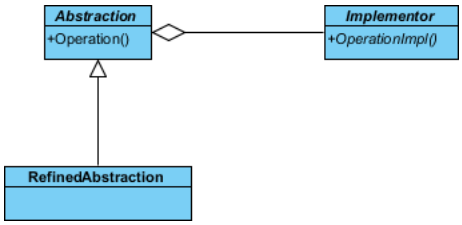
9. Right-click on the *Implementor* class, and select **Add** > **Operation** from the popup menu. Name the operation *OperationImpl()*.



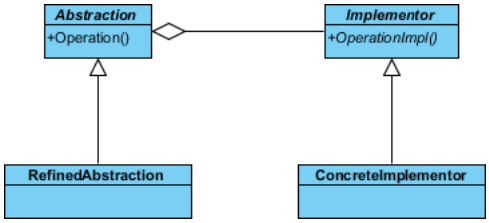
10. Right-click on *Implementor*, and select **Model Element Properties** > **Abstract** to set it as abstract.



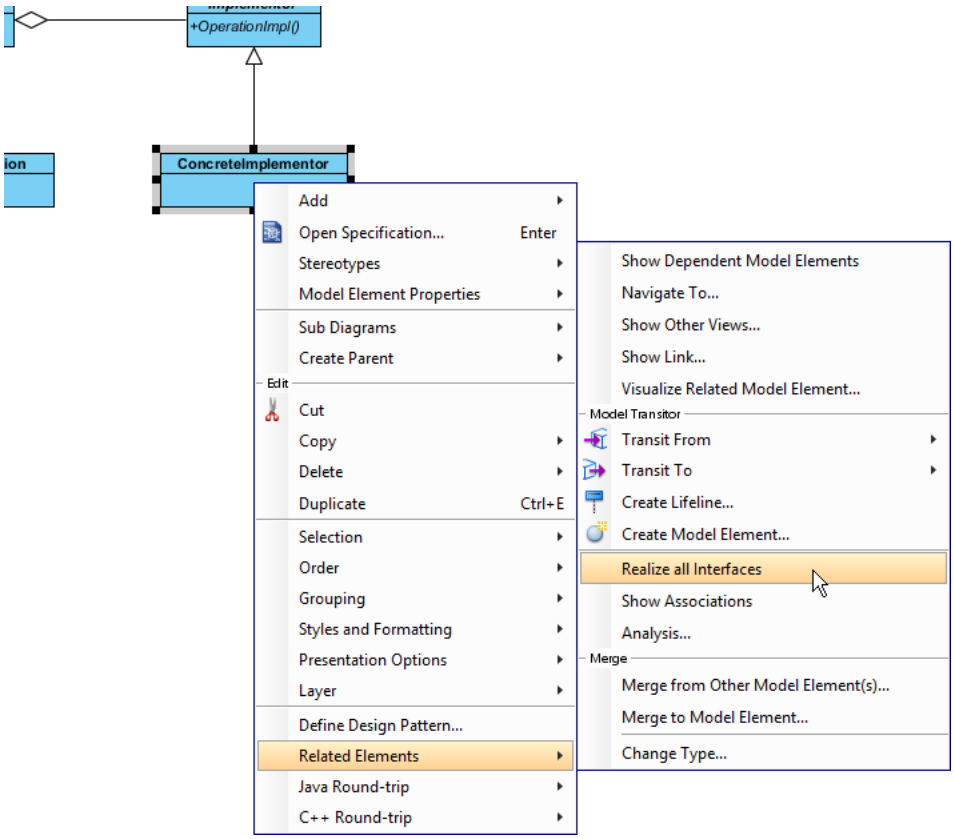
11. Move the mouse cursor over the *Abstraction* class, and drag out **Generalization** > **Class** to create a subclass *RefinedAbstraction*.



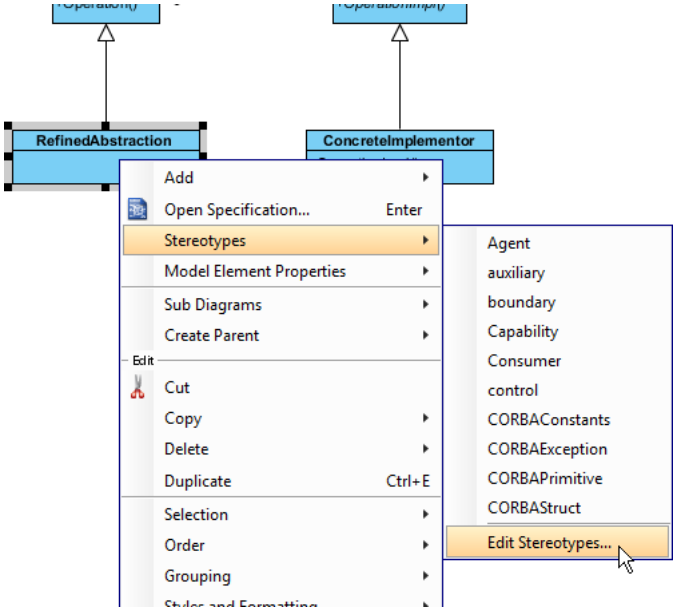
12. Repeat the previous step to create a subclass *ConcreteImplementor* from *Implementor*.



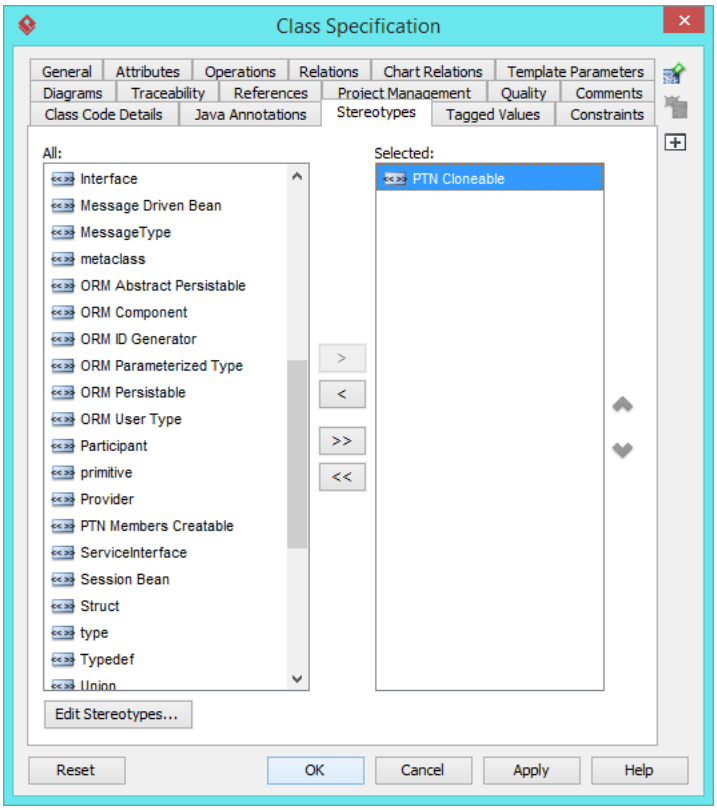
13. *ConcreteImplementor* will inherits the operations from *Implementor*. Right-click on *ConcreteImplementor* and select **Related Elements** > **Realize all Interfaces** from the popup menu.



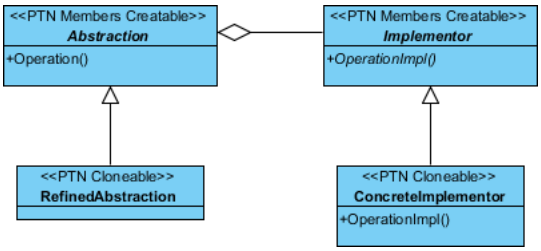
14. In practice, there may be multiple refined abstractions and/or concrete implementors. To represent this, stereotype the class *RefinedAbstraction* and *ConcreteImplementor* as **PTN Cloneable**. Right-click on *Abstraction* and select **Stereotypes** > **Stereotypes...** from the popup menu.



15. In the **Stereotypes** tab of the **Class Specification** dialog box, select **PTN Cloneable** and click > to assign it to *RefinedAbstraction* class. Click **OK** to confirm.



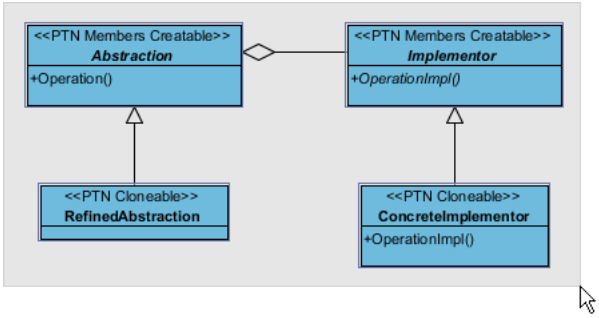
16. Repeat steps 14 and 15 on *concreteImplementor*.



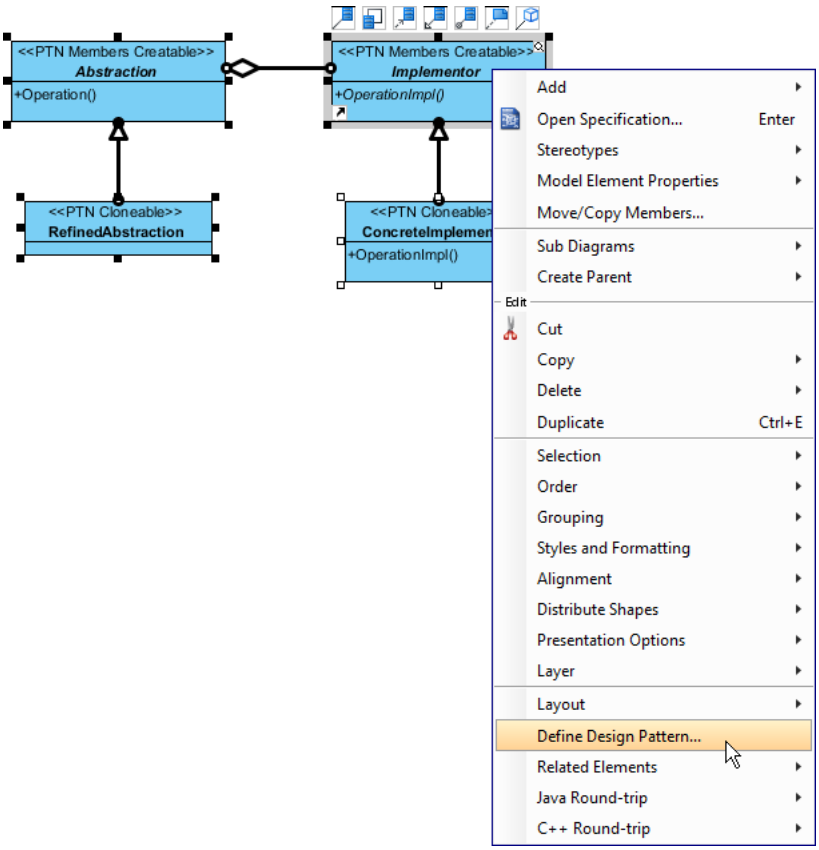
17. In practice, there may be multiple operations and/or operationImpls. To represent this, stereotype the class *Abstraction* and *Implementor* as **PTN Members Creatable**. Repeat steps 14 and 15 to stereotype *Abstraction* and *Implementor* as **PTN Members Creatable**.

Defining Pattern

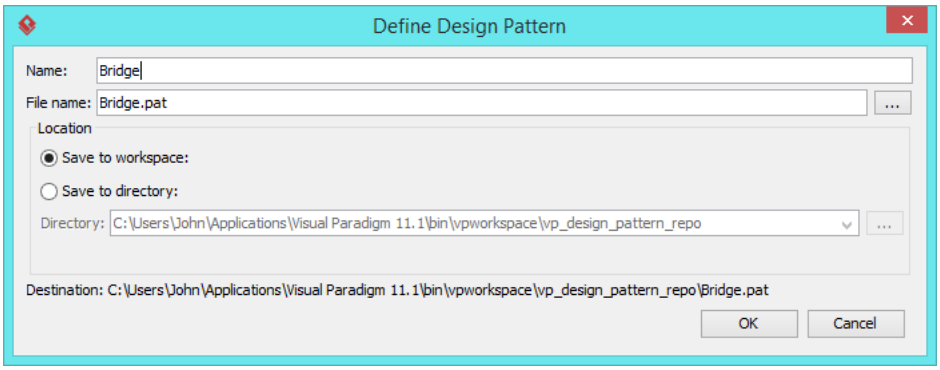
1. Select all classes on the class diagram.



2. Right-click on the selection and select **Define Design Pattern...** from the popup menu.



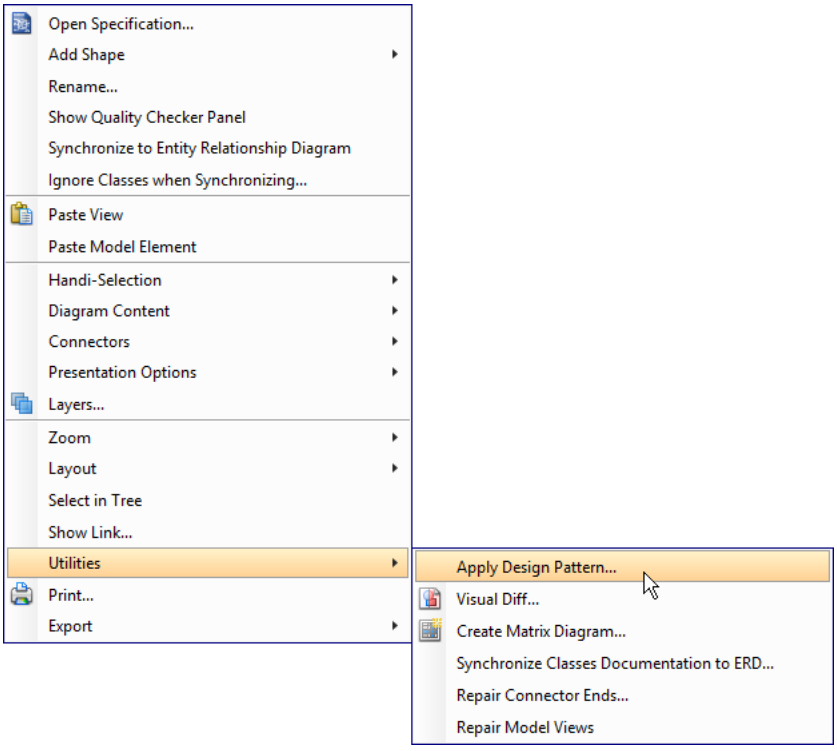
3. In the **Define Design Pattern** dialog box, specify the pattern name *Bridge*. Keep the file name as is. Click **OK** to proceed.



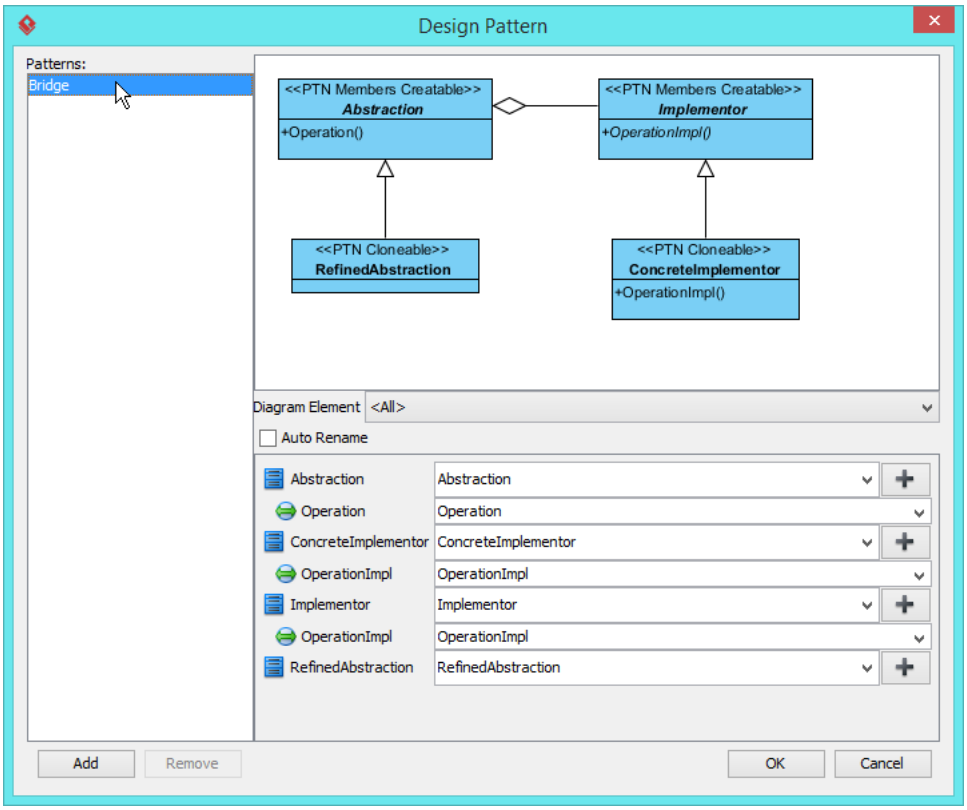
Applying Design Pattern on Class Diagram

In this section, we are going to apply the bridge pattern to model a report generator for various report types.

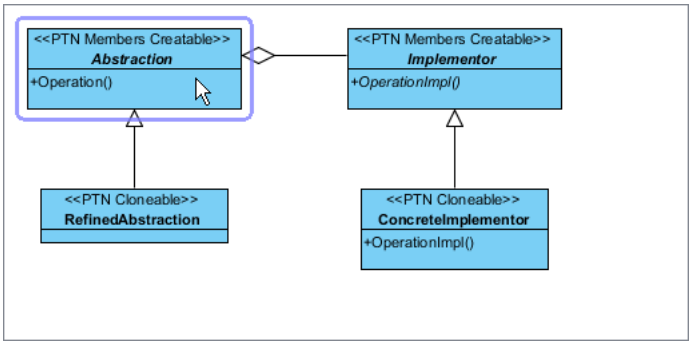
1. Create a new project *Diagram Editor*.
2. Create a class diagram *Domain Model*.
3. Right-click on the class diagram and select **Utilities** > **Apply Design Pattern...** from the popup menu.



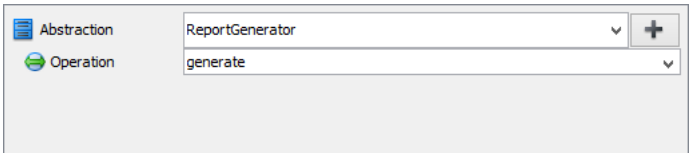
4. In the **Design Pattern** dialog box, select *Bridge* from the list of patterns.



5. Click on *Abstraction* in the overview.

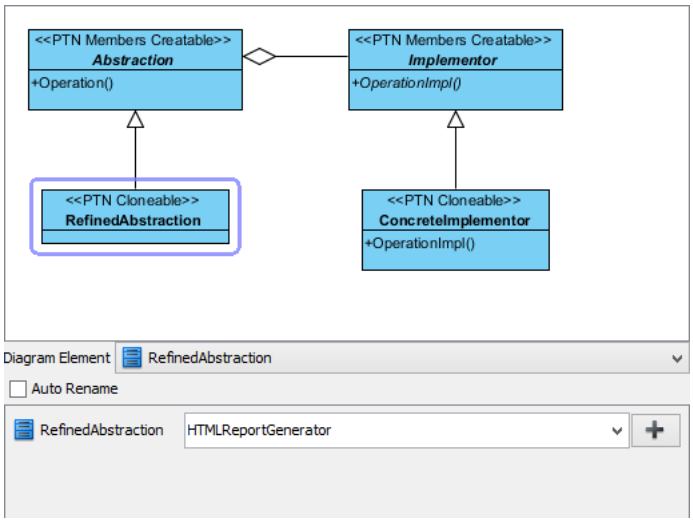


6. Rename *Abstraction* to *ReportGenerator* and operation *Operation* to *generate* at the bottom pane.



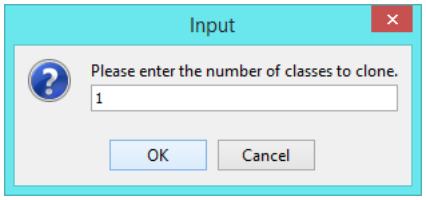
7. Select *RefinedAbstraction* in the overview pane.

8. Rename *RefinedAbstraction* to *HTMLReportGenerator*.

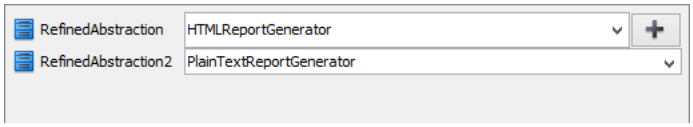


9. Besides HTML report generator, we need also a Plain Text report generator. Click on the + button at the bottom pane, beside *Abstraction*, and select **Clone...**

10. Enter *1* to be the number of classes to clone. Click **OK** to confirm.

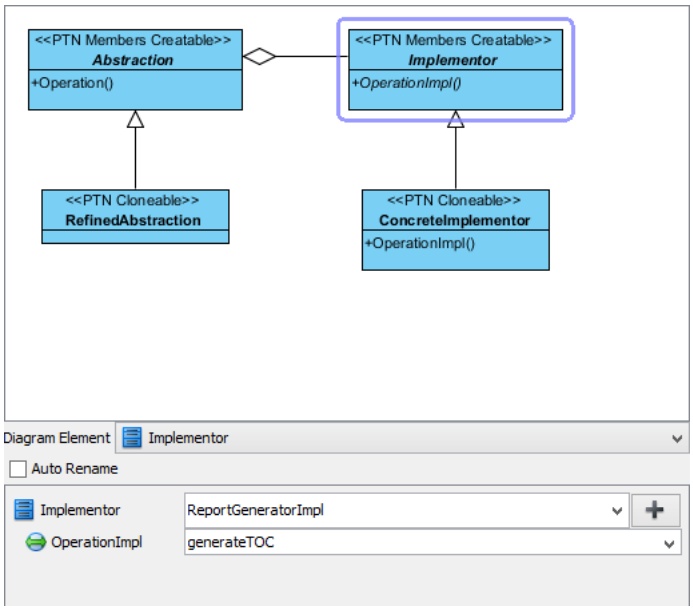


11. Rename *RefinedAbstraction2*, the cloned class, to *PlainTextReportGenerator*.

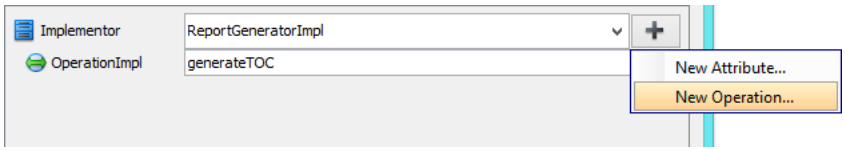


12. Select Implementor in the overview pane.

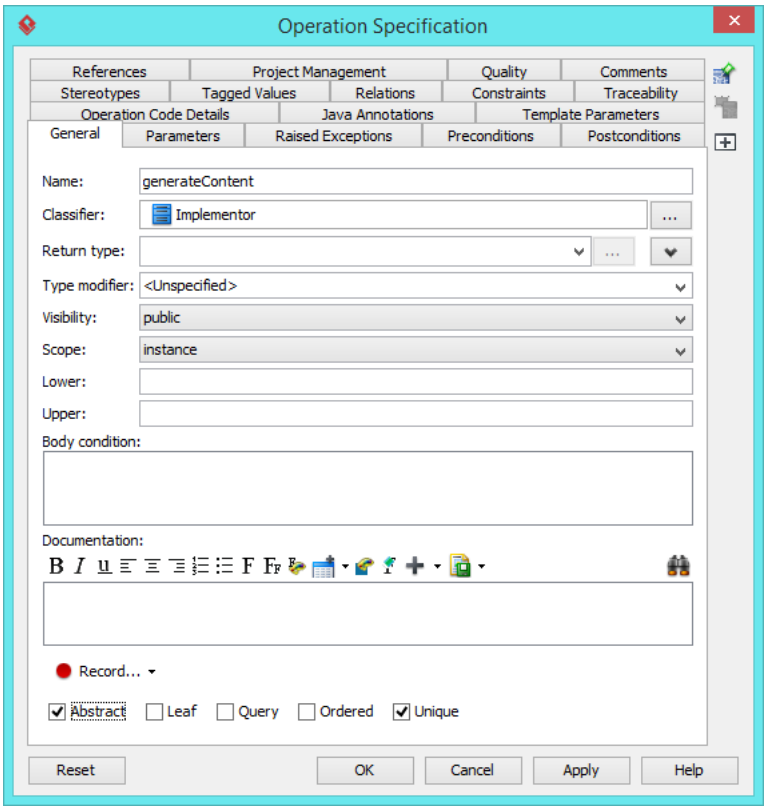
13. Rename *Implementor* to *ReportGeneratorImpl*, and *OperationImpl* to *generateTOC*.



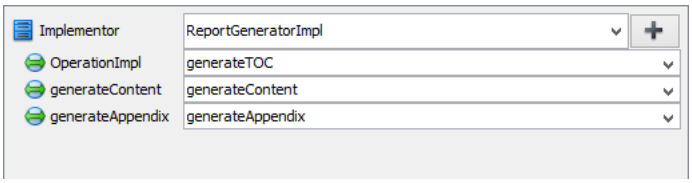
14. We need 2 more operations for generating content and appendix. Click on the + button and select **New Operation...** from the popup meun.



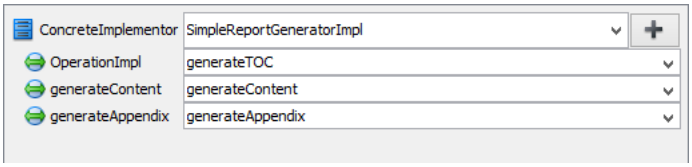
15. In the **Operation Specification** dialog box, name the operation *generateContent*. Check **Abstract** at the bottom of the dialog box.



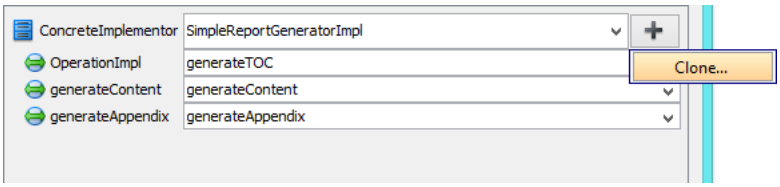
16. Repeat the previous steps to create another abstract operation *generateAppendix*.



17. Select *ConcreteImplementor* in overview. Rename *ConcreteImplementor* to *SimpleReportGeneratorImpl*, and operation *OperationImpl* to *generateTOC*.

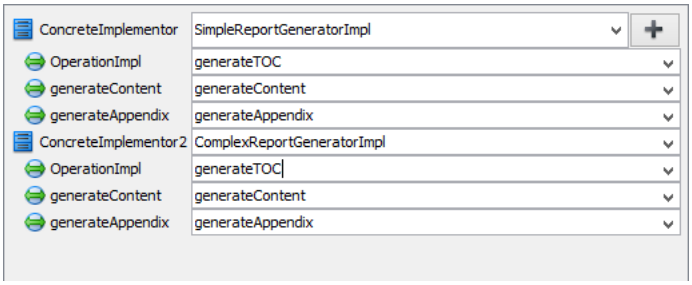


18. Similar to *RefinedAbstraction*, here we need to have another concrete implementor for generating complex report. Click on the + button and select **Clone...** from the popup menu.

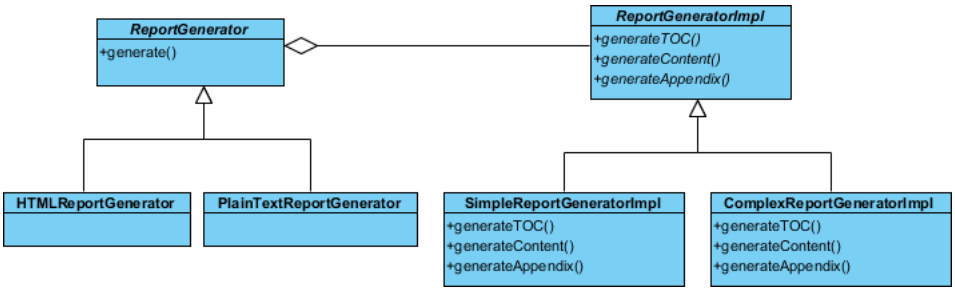


19. Enter *1* to be the number of classes to clone. Click **OK** to confirm.

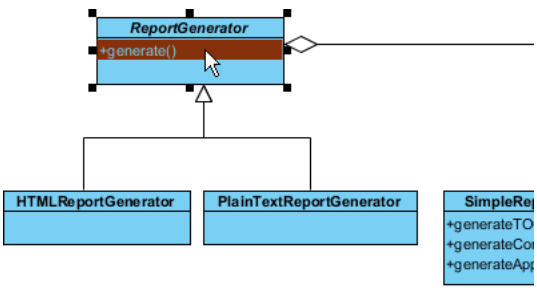
20. Rename *ConcreteImplmentor2*, the cloned class, to *ComplexReportGeneratorImpl*, and operation *OperationImpl* to *generateTOC*.



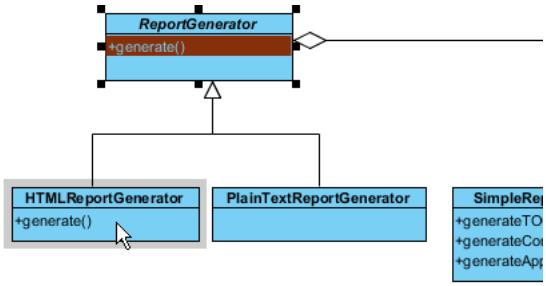
21. Click **OK** to confirm. Here is the diagram formed:



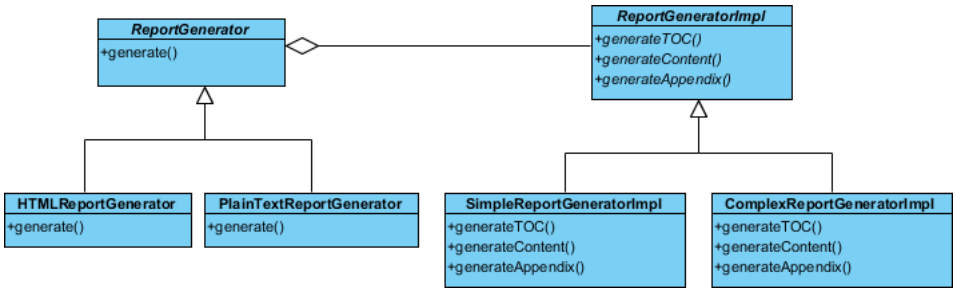
22. We want *HTMLReportGenerator* and *PlainTextReportGenerator* to implement their own way of generating repot. Select the generate operation is *ReportGenerator*.



23. Press the **Ctrl** key, and drag to *HTMLReportGenerator*. Replease the mouse button afterwards.



24. Repeat the previous steps to create the generate method in *PlainTextReportGenerator*. Here is the completed diagram:



Resources

1. Bridge.pat
2. Design Patterns.vpp

Related Links

- Full set of UML tools and UML diagrams

Visual Paradigm

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

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