Factory Method Pattern Tutorial

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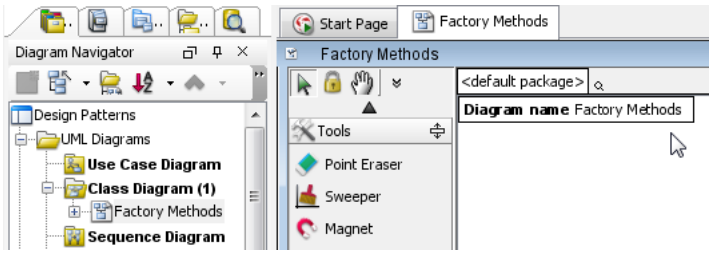
This tutorial is aimed to guide the definition and application of Gang of Four (GoF) factory design pattern. By reading this tutorial, you will know how to develop a model for the factory pattern, and how to apply it in practice.

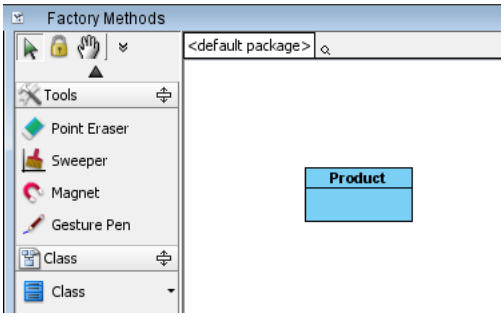
Modeling Design Pattern with Class Diagram

1. Create a new project *Design Patterns*.

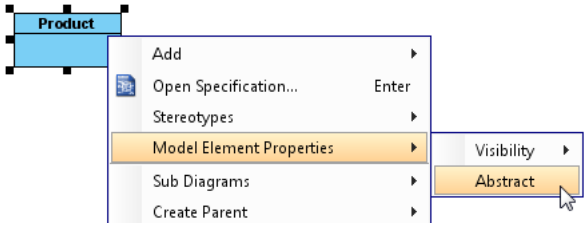
2. Create a class diagram *Factory Method*.



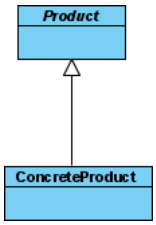
3. Select **Class** from diagram toolbar. Click on diagram to create a class. Name it as *Product*.



4. Set the *Product* class abstract by right clicking on it and selecting **Model Element Properties** > **Abstract** from the popup menu.

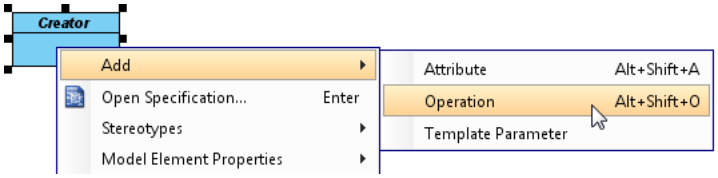


5. Move the mouse cursor over the *Product* class, and drag out **Generalization** > **Class** to create a subclass *ConcreteProduct*.

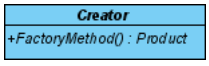


6. Create a class *Creator*, and set it as abstract.

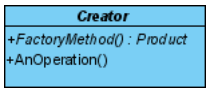
7. Right click on the *Creator* class, and select **Add** > **Operation** from the popup menu.



8. Name the operation *FactoryMethod()*, and make it return *Product*.
9. Right click on *FactoryMethod()*, and select **Model Element Properties** > **Abstract** to set it as abstract.

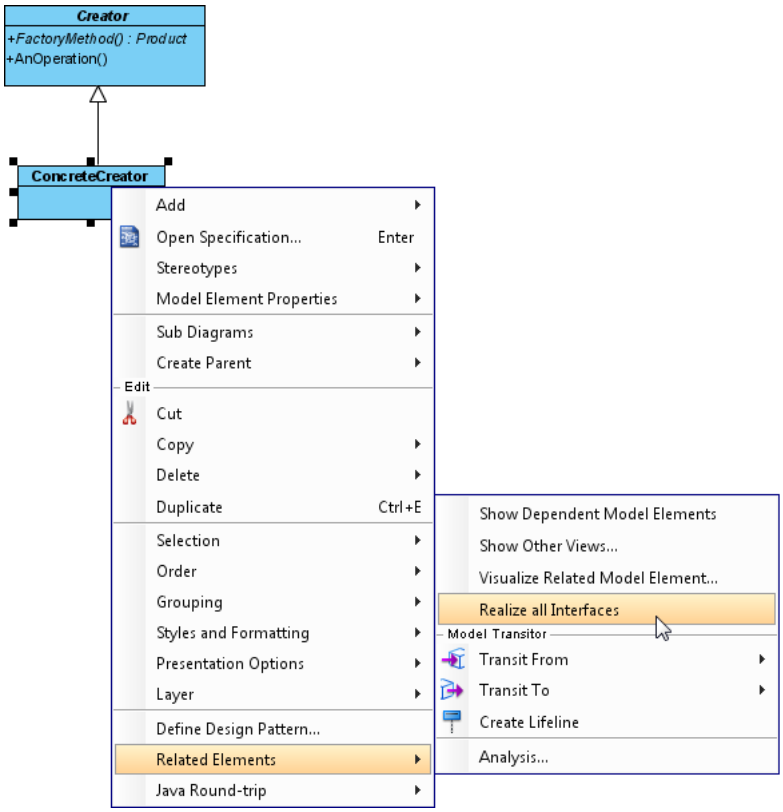


10. Add a non abstract operation *AnOperation()* to *Creator*.

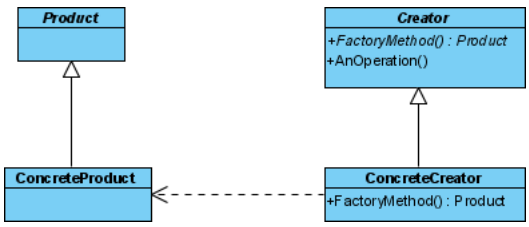


11. Move the mouse cursor over the *Creator* class, and drag out **Generalization** > **Class** to create a subclass *ConcreteCreator*.

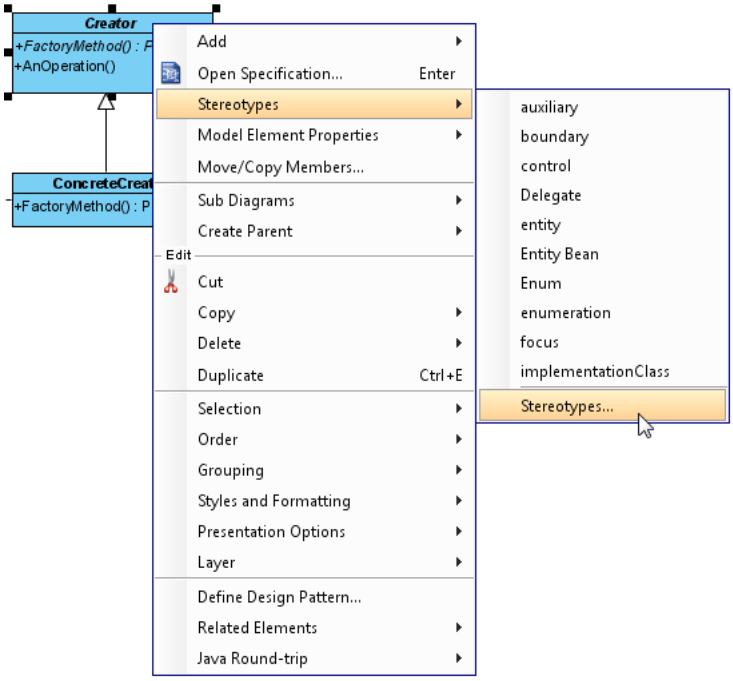
12. Make *ConcreteCreator* inherit the abstract operations provided from *Creator* by right clicking on *ConcreteCreator*, and selecting **Related Elements** > **Realize all Interfaces** from the popup menu.



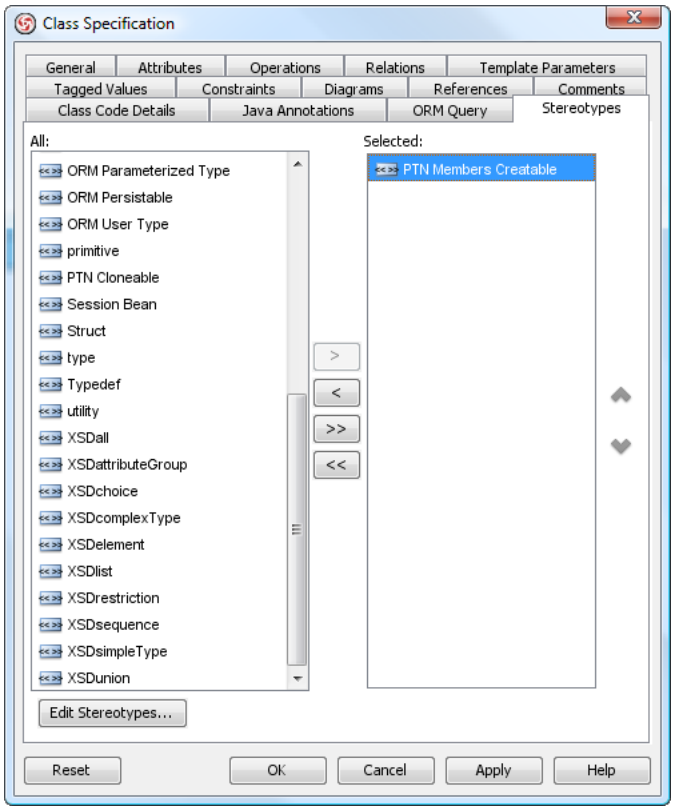
13. In practice, the *FactoryMethod* in *ConcreteCreator* is expected to return an instance of *ConcreteProduct*. Therefore, add a dependency between *ConcreteCreator* and *ConcreteProduct*. Move the mouse cursor over the *ConcreteCreator* class, and drag out **Dependency** > **Class** to *ConcreteProduct*. Up to now, the diagram should look like this:



14. There may be more than one operations in the *Creator* class. To represent this, stereotype the *Creator* class as **PTN Members Creatable**. Right click on **Creator** class and select **Stereotypes** > **Stereotype** from the popup menu.

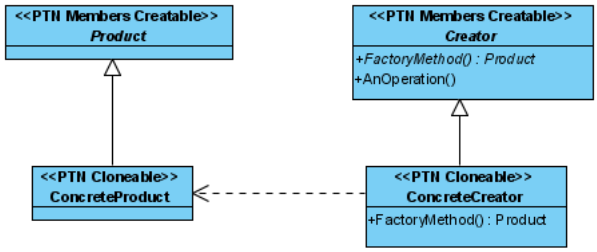


15. In the **Stereotypes** tab of class specification, select **PTN Members Creatable** and click > to assign it to the class. Click **OK** to confirm.



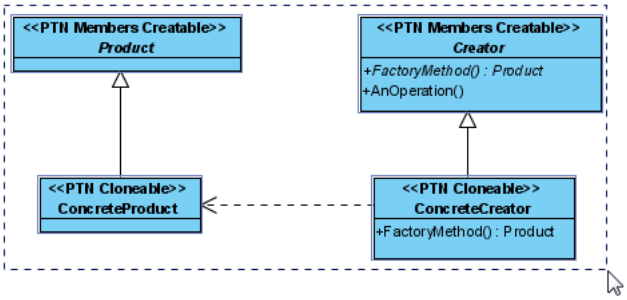
16. The *Product* class should also have its own operations. Repeat step 14 and 15 to stereotype it as **PTN Members Creatable**.

17. There may be multiple concrete products and creator. Let's repeat step 14 and 15 to stereotype *ConcreteProduct* and *ConcreteCreator* as **PTN Cloneable**. The diagram should look like this:

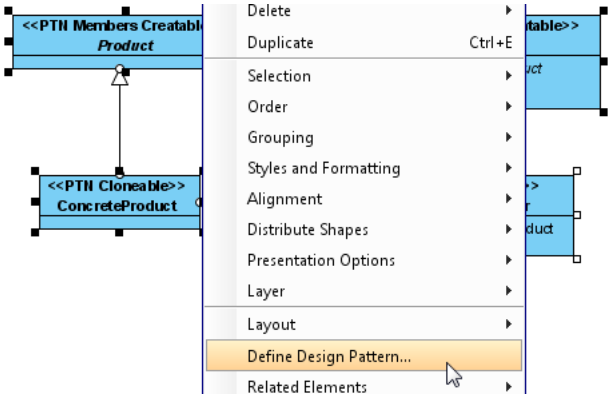


Defining Pattern

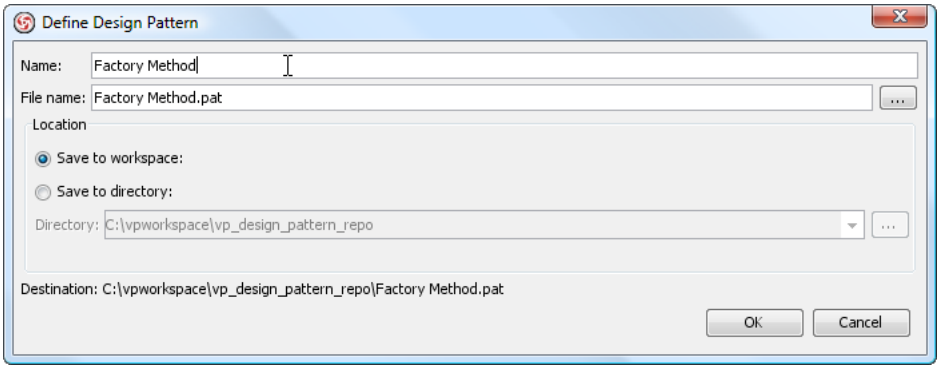
1. Select all classes on the class diagram.



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 *Factory Method*. Keep the file name as is. Click **OK** to proceed.

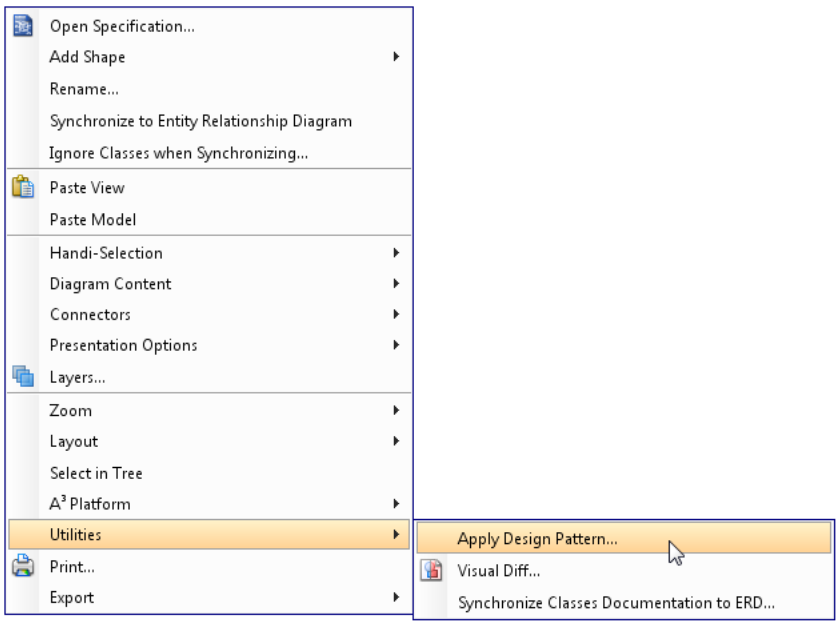


Applying Design Pattern on Class Diagram

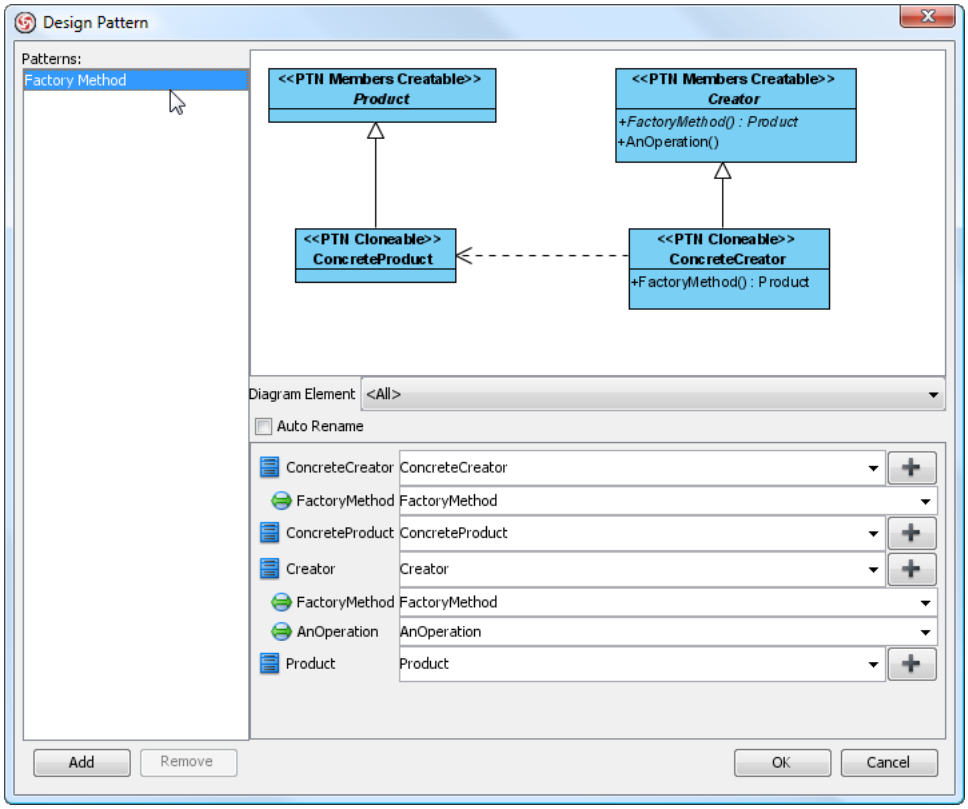
In this section, we will try to make use of the factory method pattern to model a part of a text editor.

1. Create a new project *Text Editor*
2. Create a class diagram *Domain Model*.

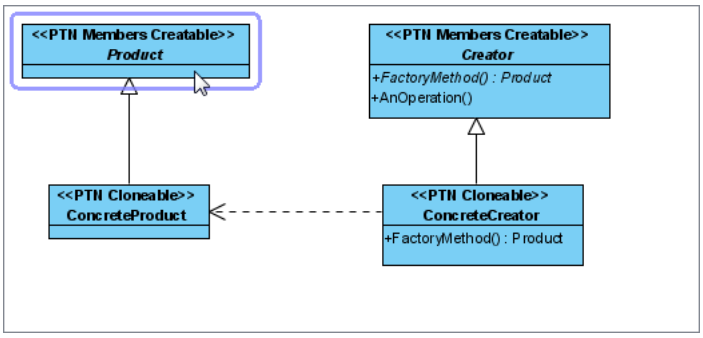
3. Right click on the class diagram and select **Utilities** > **Apply Design Pattern...** from the popup menu.



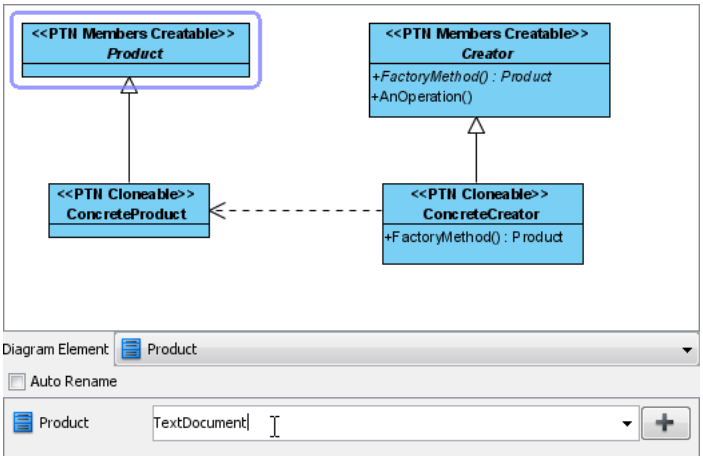
4. In the **Design Pattern** dialog box, select *Factory Method* from the list of patterns.



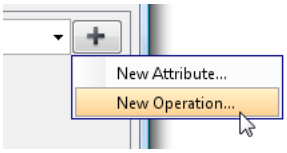
5. Click on **Product** in the overview.



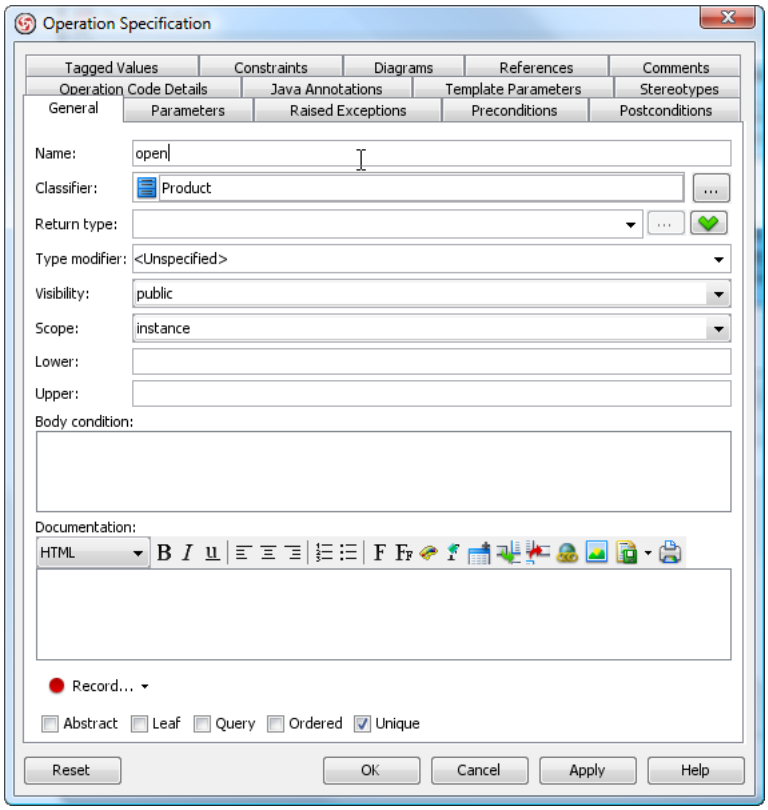
6. Rename it to *TextDocument* at the bottom pane.



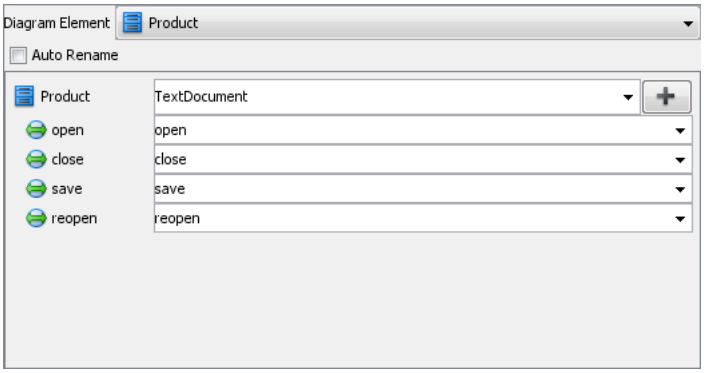
7. Click on +, and select **New Operation...** from the popup menu. We shall create the operations available in the *TextDocument* class.



8. In the **Operation Specification** dialog box, enter *Open* as operation name.

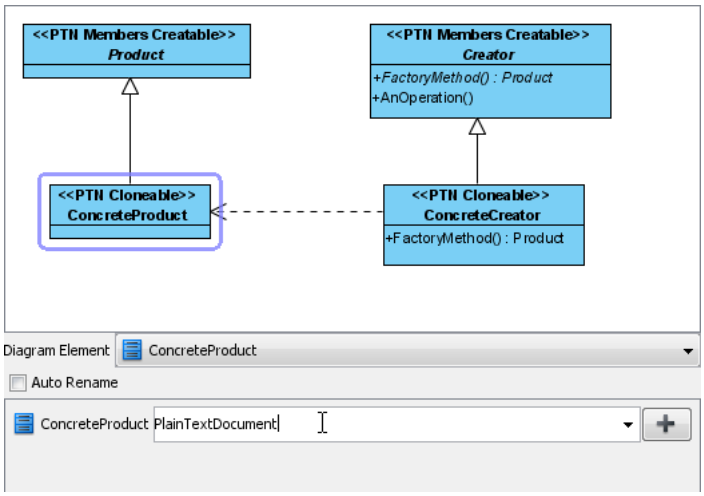


9. Repeat step 7 and 8 to create operations *close*, *save*, *reopen*.

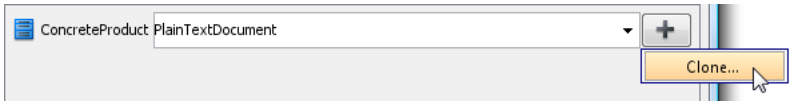


10. Click on *ConcreteProduct* in the overview.

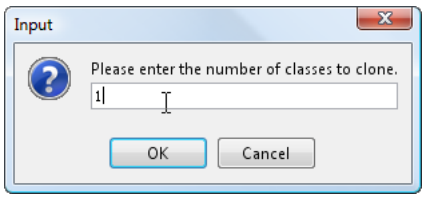
11. Rename *ConcreteProduct* to *PlainTextDocument*.



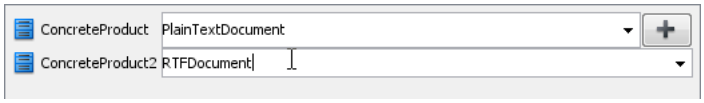
12. We need to process one more document type for RTF document. Keep *ConcreteProduct* selected and click the + button, then select **Clone...** in the popup menu.



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

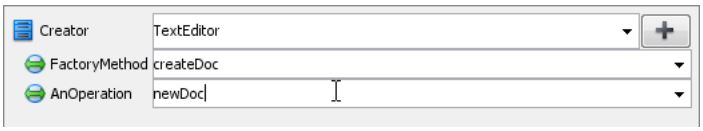


14. Enter *RTFDocument* as class name.

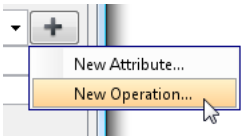


15. Select the *Creator* class in overview.

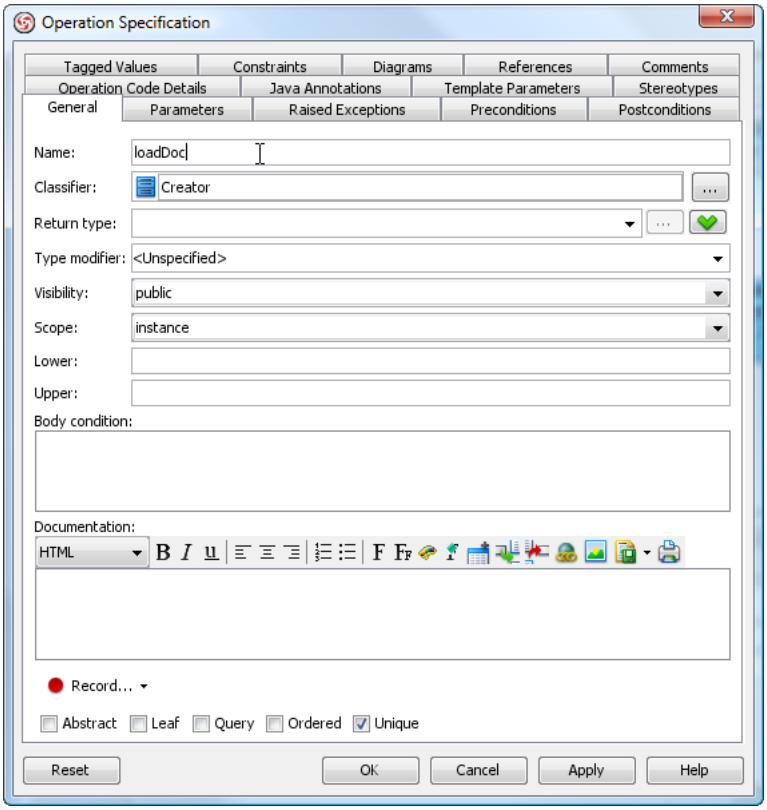
16. Rename *Creator* to *TextEditor*, operations *FactoryMethod* to *createDoc*, *AnOperation* to *newDoc*.



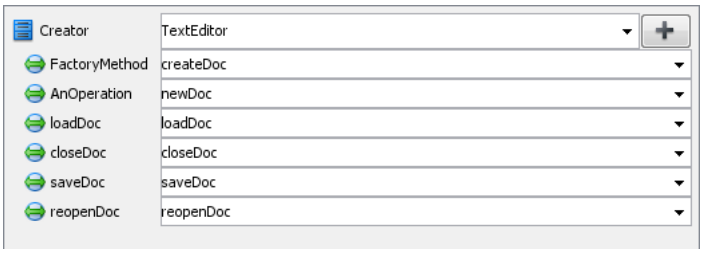
17. We need more operations. Click on +, then select **New Operation...** from the popup menu.



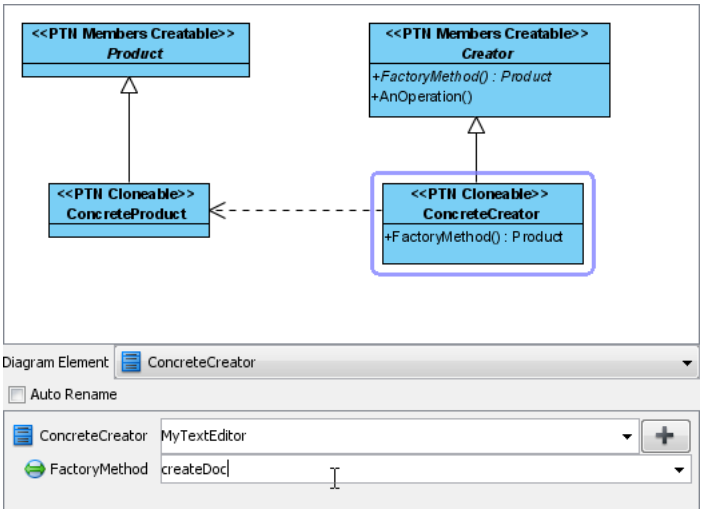
18. In the **Operation Specification** dialog box, enter *loadDoc* as name.



19. Repeat the previous steps to create operations *closeDoc*, *saveDoc*, *reopenDoc*.

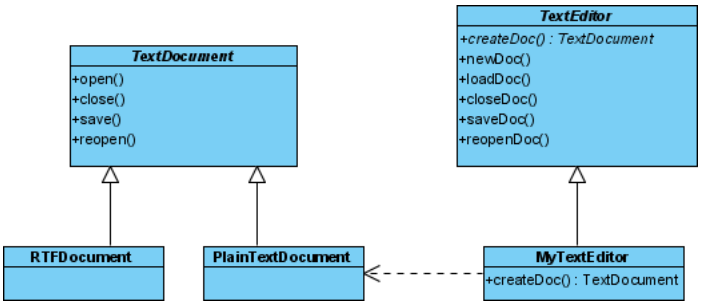


20. Select *ConcreteCreator*. Rename *ConcreteCreator* to *MyTextEditor* and operation *FactoryMethod* to *createDoc*.



21. Click **OK** to confirm editing and apply the pattern to diagram.

22. Tidy up the diagram. It should become:



Resources

1. Design Patterns.vpp
2. Factory Method.pat

Related Links

- Full set of UML tools and UML diagrams

Visual Paradigm home page
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