

Appendix B. Working with a UML Modeling Tool

As you followed along with the book's discussion and did the exercises, you probably used pencil and paper to create your diagrams. If you had to do that in your project-related modeling efforts, you'd quickly hit a number of snags. In addition to drawing those troublesome lines, circles, ellipses, and rectangles, you'd have a difficult time when you wanted to move them around and change the layout of a finished diagram.

Fortunately, technology comes to the rescue. A number of tools are available to help you create UML models.

What You Should Find in a Modeling Tool

One fundamental feature of a UML modeling tool is a palette of UML elements. You use that palette to create diagrams by selecting elements from the palette and then dragging and dropping them onto a drawing page. Once you've added your elements, "rubber-band" diagramming allows you to create a connection between two elements and have the connection adjust accordingly when you drag those elements around the screen.

Another important feature is the use of dialog boxes for editing. That is, if you want to modify an element in a diagram, you should be able to somehow access a dialog box for that element and enter information into its fields. Because of those dialog boxes, one thing you find when you work with a modeling tool is that the model consists of more than just the diagrams: Much of the model's information resides in the dialog boxes that sit behind the diagrams.

Still another practical consideration is that the tool should allow you the flexibility to format the onscreen information in various ways.

Possibly the most important feature of a UML modeling tool is what I call its dictionary. This is a record of all the elements you create and all their features. In addition to keeping track of your creations, the dictionary is important because it enables you to reuse them from diagram to diagram. In other words, if you create a class for one diagram, you should be able to use it again by selecting it from the dictionary and dragging-and-dropping it onto another.

Finally, some high-end (read "expensive") modeling tools allow you to generate code from your models.

When I wrote the earlier editions of this book, only a few UML modeling tools were available, and I discussed three of them.

Since those earlier editions, the number of modeling tools has grown substantially. Two that come to mind, for example, are Together, a recent acquisition of Borland, and Poseidon, a product of Gentleware.

Rather than survey the entire field, I thought that this time around, I'd give you a feel for what it's like to work with a modeling tool: I'll take you through some steps with one of them—Microsoft Visio Professional Edition. If you're familiar with Visio, that's helpful. If not, that's OK, too.

Working with UML in Visio Professional Edition

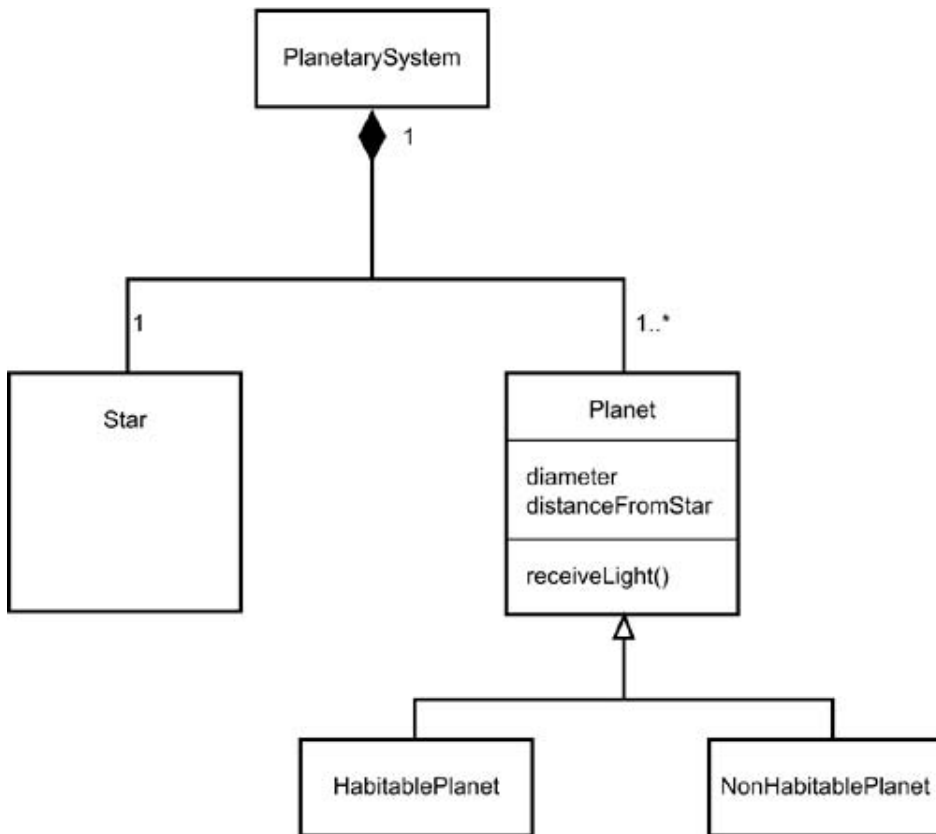
One of the best-known diagramming tools, Visio Professional Edition adds a number of UML-related capabilities that turn it into a surprisingly strong modeling tool. UML is just one of Visio's capabilities.

I'll walk you through the creation of a class diagram, an object diagram, and a sequence diagram. As I do, I'll point out the features of this tool.

To give you an idea of where you're headed, I'll start by showing you the diagrams I'm going to create. The diagrams will form a rudimentary model of our solar system. Because I'm focusing on the tool rather than on the UML, I'll keep the diagrams simple.

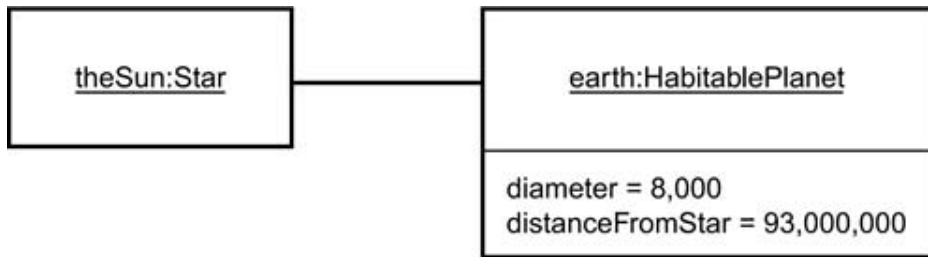
Because our particular solar system is an instance of a planetary system, you'll begin with a class model of a planetary system as shown in [Figure B.1](#).

Figure B.1. A class model of a planetary system.



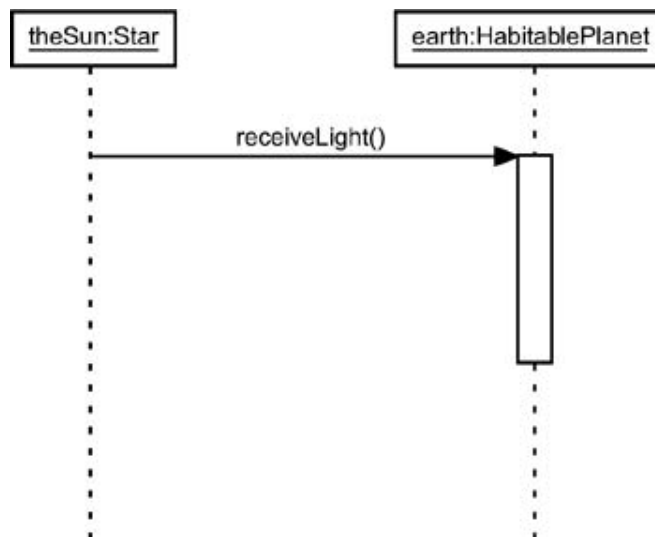
[Figure B.2](#) is an object diagram of Earth and the sun. If you're feeling ambitious, you can fill in the remaining planets.

Figure B.2. An object model of Earth and the sun.



The sequence diagram ([Figure B.3](#)) shows just one message from the sun to Earth. (I told you I'd keep it simple.)

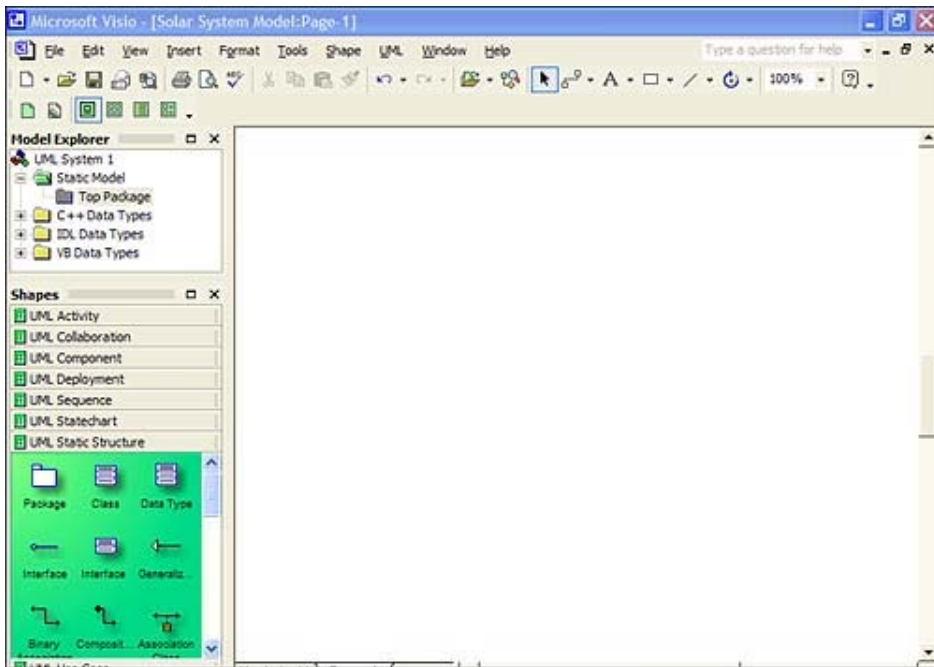
Figure B.3. A sequence diagram showing one interaction between the sun and Earth.



Getting Started

[Figure B.4](#) shows Visio ready for UML modeling. The large white area is the Drawing page. Model Explorer (upper left) is Visio's dictionary. Visio's palette of UML elements is in the lower left. It's called "Shapes," and it consists of a number of tabbed pages. Each tabbed page supplies the icons for a specific UML diagram. When Visio opens in the UML, the UML Static Structure tabbed page is visible. This one enables you to create class diagrams and object diagrams.

Figure B.4. Visio ready for UML modeling.

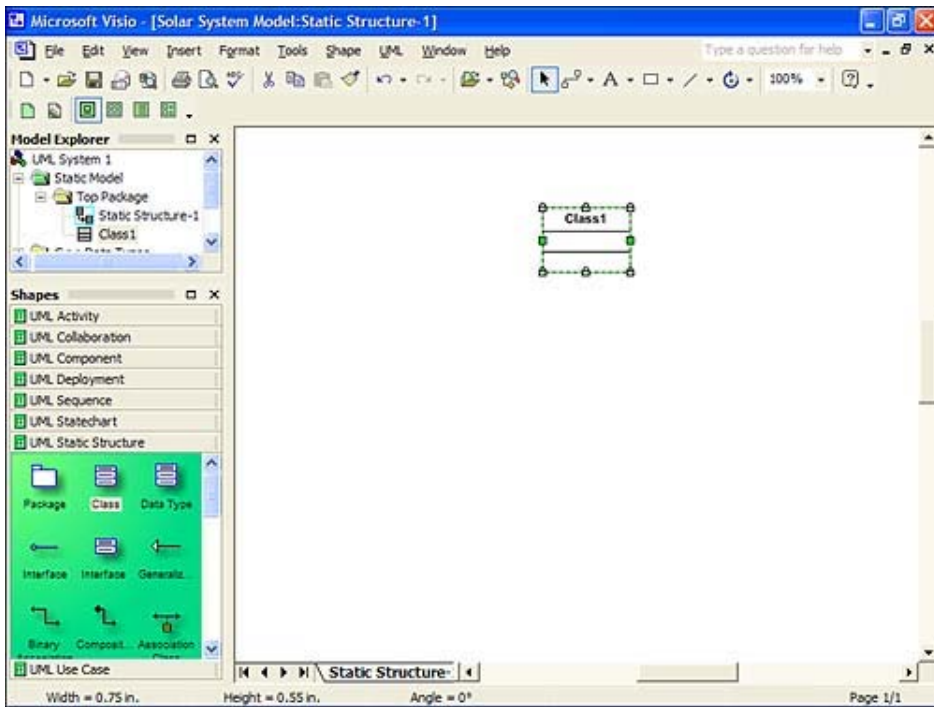


Just to get you in the mood, I'll write this as if you have Visio Professional and you're working along.

The Class Diagram

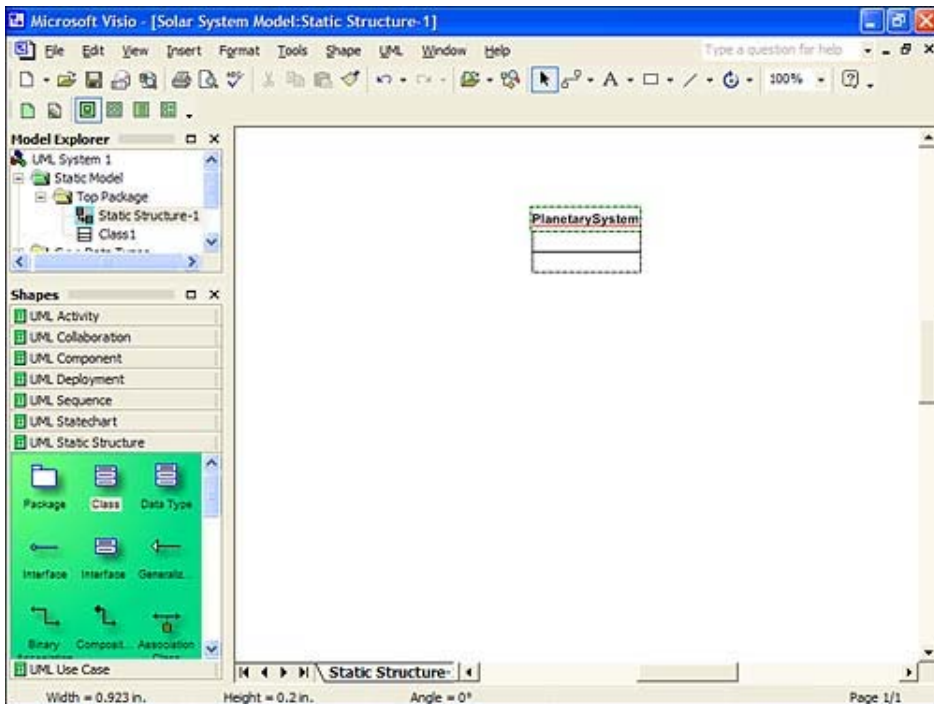
The first step is to select a class icon from UML Static Structure and drop it on the Drawing page. This causes the Drawing page to resemble [Figure B.5](#).

Figure B.5. Starting the class diagram.



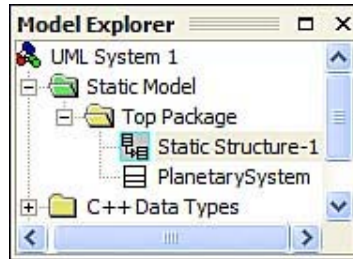
Next, with the class selected on the Drawing page you type **PlanetarySystem** to rename the class. (Figure B.6)

Figure B.6. Renaming the class.



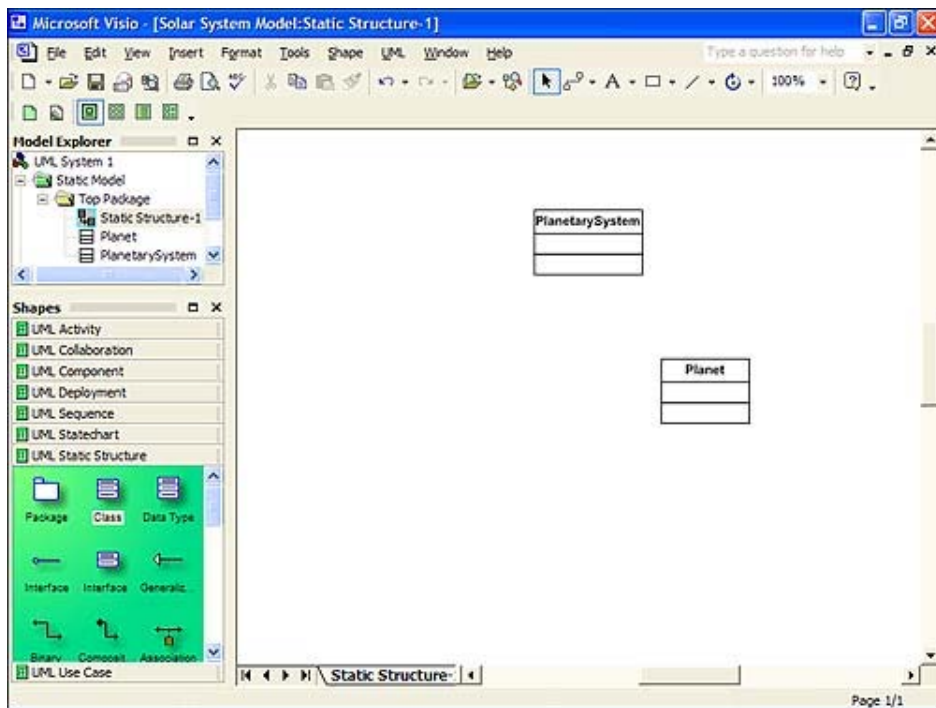
Model Explorer reflects the addition of the new class. ([Figure B.7](#))

Figure B.7. The `PlanetarySystem` class in Model Explorer.



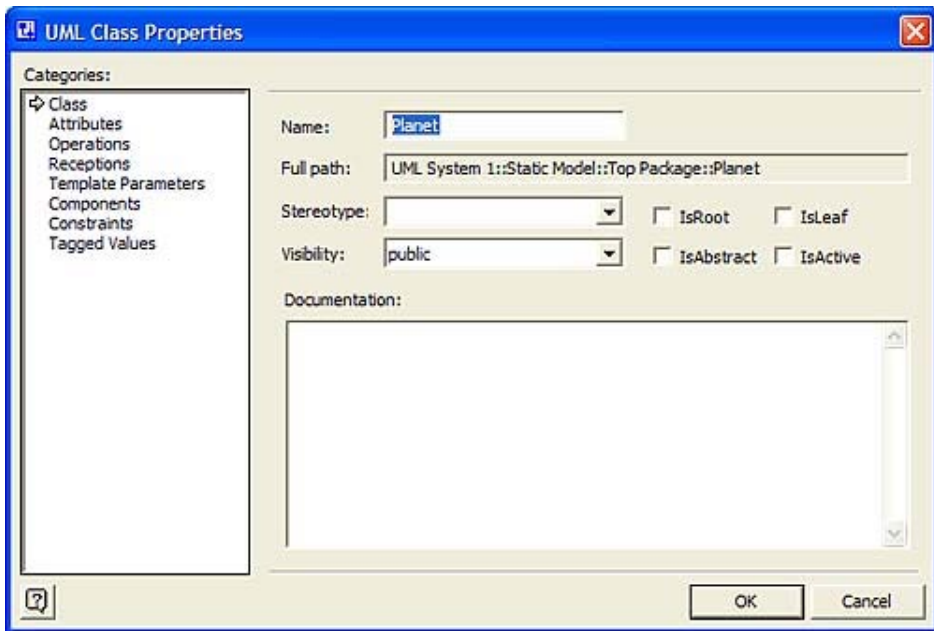
Now you can add the `Planet` class, as in [Figure B.8](#).

Figure B.8. Adding the `Planet` class.



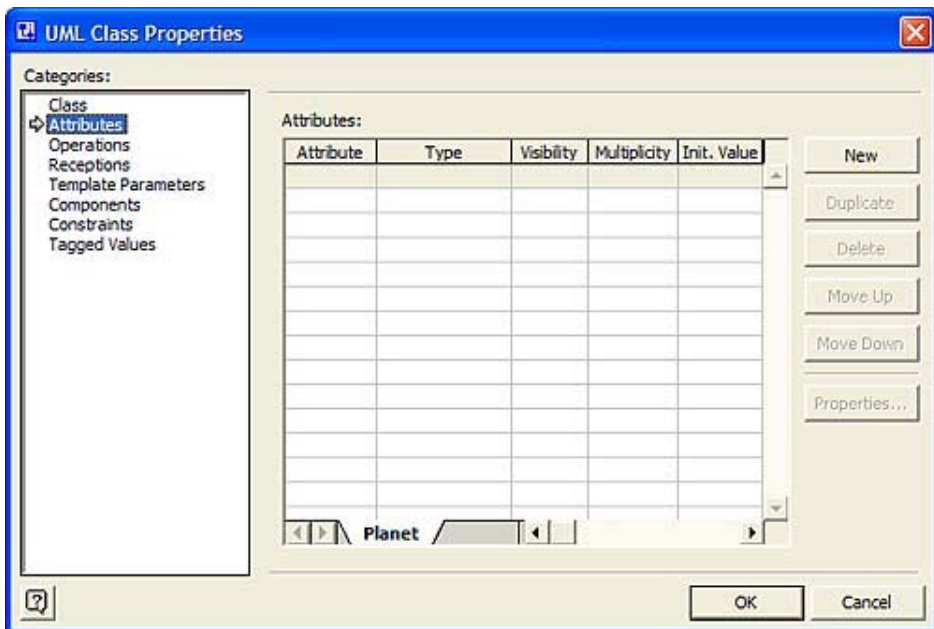
For this class, you'll add the two attributes and the operation from [Figure B.1](#), and you'll make `Planet` an abstract class. To do this, double-click on the `Planet` class to bring up the UML Class Properties dialog box ([Figure B.9](#)).

Figure B.9. The UML Class Properties dialog box.



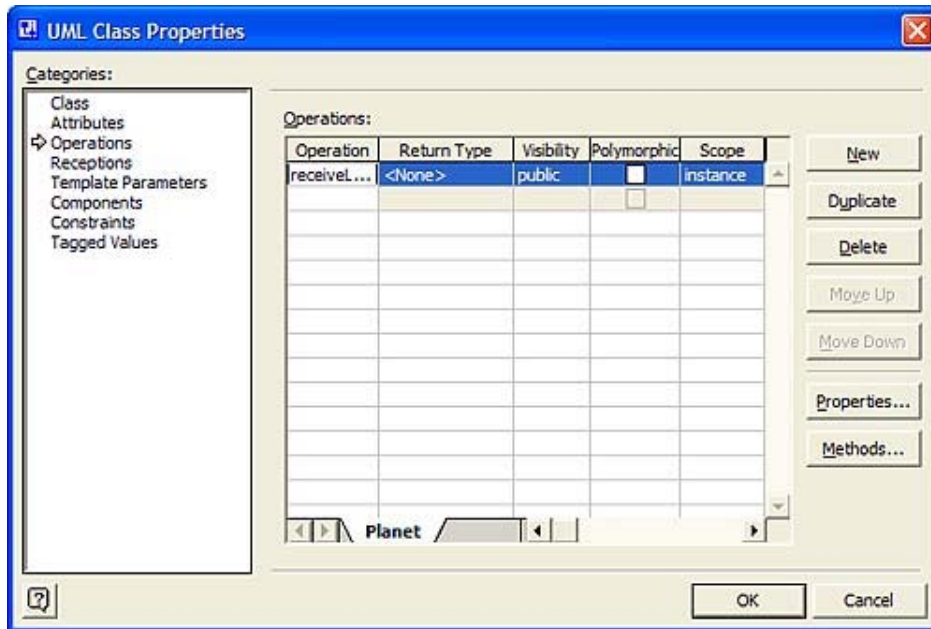
The first step is to click the `IsAbstract` checkbox. Next, select `Attributes` from the `Categories` field on the left to open the `Attributes` table in this dialog box (Figure B.10).

Figure B.10. The `Attributes` table for the `Planet` class.



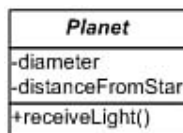
Type `diameter` and `distanceFromStar` into this table. Then select `Operations` from the `Categories` field to open the `Operations` table, into which you type `receiveLight`, as shown in Figure B.11.

Figure B.11. The Operations table for the Planet class.



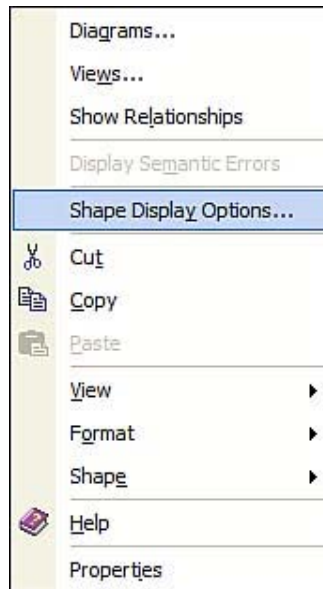
Clicking OK gives you the abstract Planet class with its attributes and its operation, as in [Figure B.12](#).

Figure B.12. The abstract class Planet with its attributes and operation.



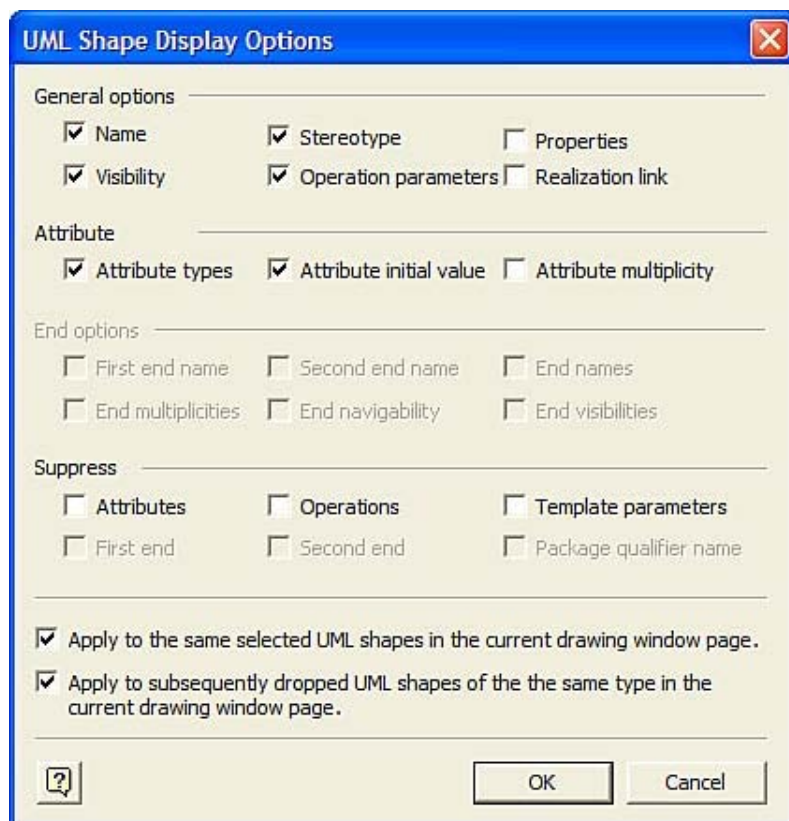
Note the minus sign to the left of each attribute and the plus sign to the left of the operation. These are the visibilities. To make the diagram less busy, you can take them out of the diagram. In order to do that, right-click on the Planet class to bring up the popup menu in [Figure B.13](#).

Figure B.13. Right-clicking a model element pops up this menu.



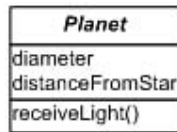
Selecting Shape Display Options opens the UML Shape Display Options dialog box in [Figure B.14](#).

Figure B.14. The UML Shape Display Options dialog box.



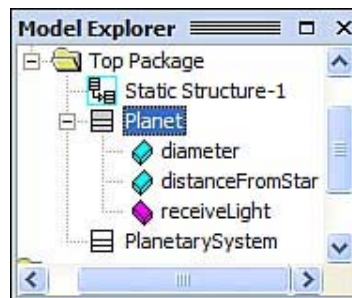
Unchecking the Visibility checkbox and clicking OK makes the `Planet` class look like [Figure B.15](#). By the way, if you look closely at [Figure B.14](#), you'll notice the checks in the two bottom checkboxes. Checking these boxes specifies that your choices in this dialog box determine the appearance of any subsequent elements of this type in this diagram.

Figure B.15. The `Planet` class without the visibilities.



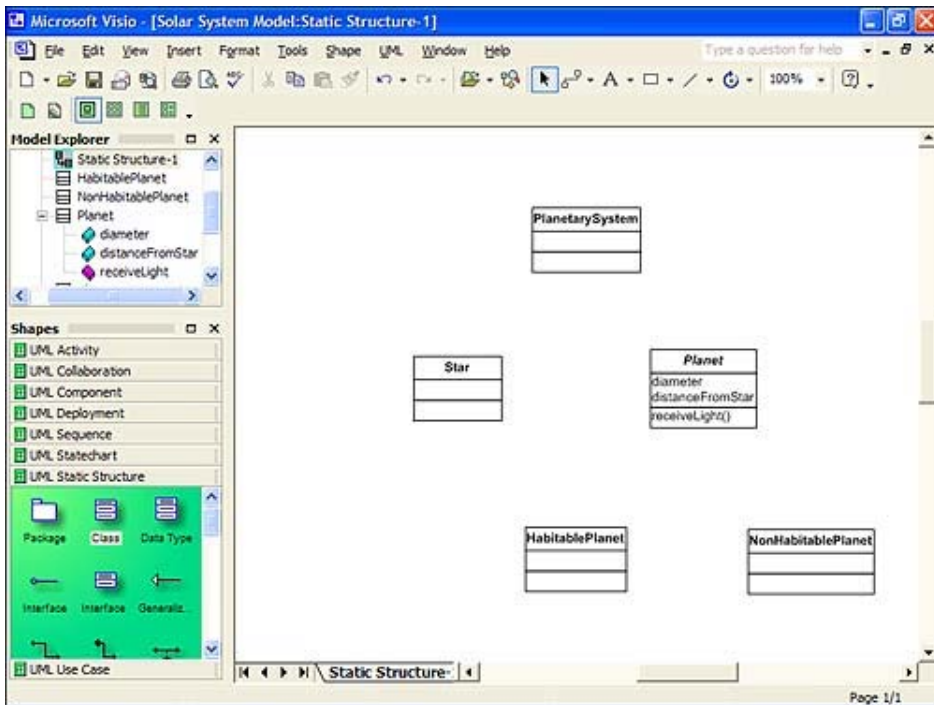
Note that the `Planet` class and its attributes and operation are now in Model Explorer ([Figure B.16](#)).

Figure B.16. Model Explorer records the attributes and operation of the `Planet` class.



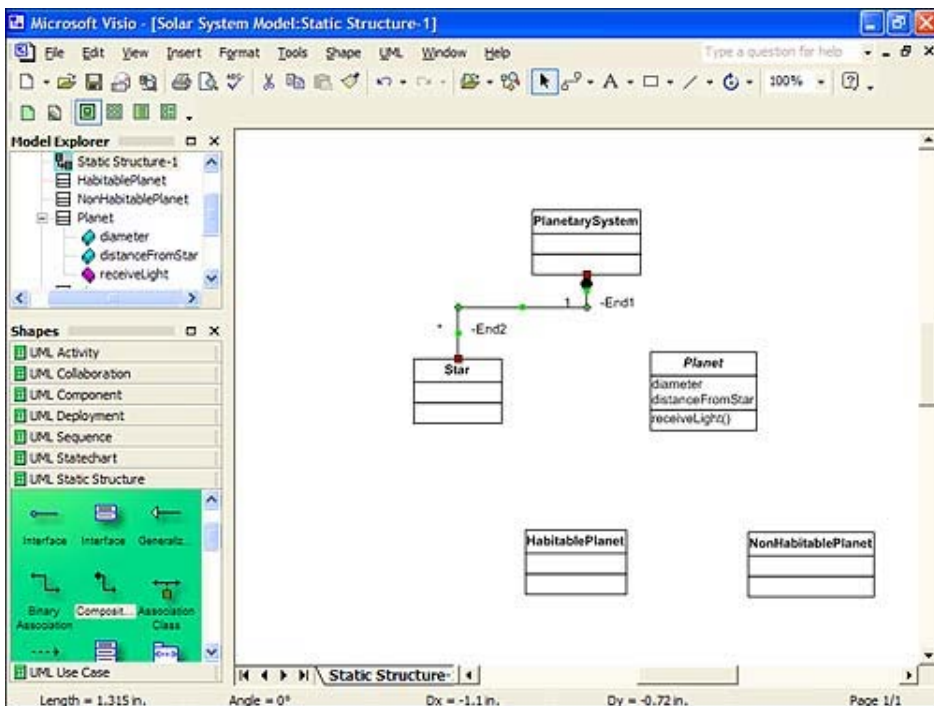
The next order of business is to drag and drop the remaining classes into the diagram so that the Drawing page resembles [Figure B.17](#).

Figure B.17. All the classes in the model.



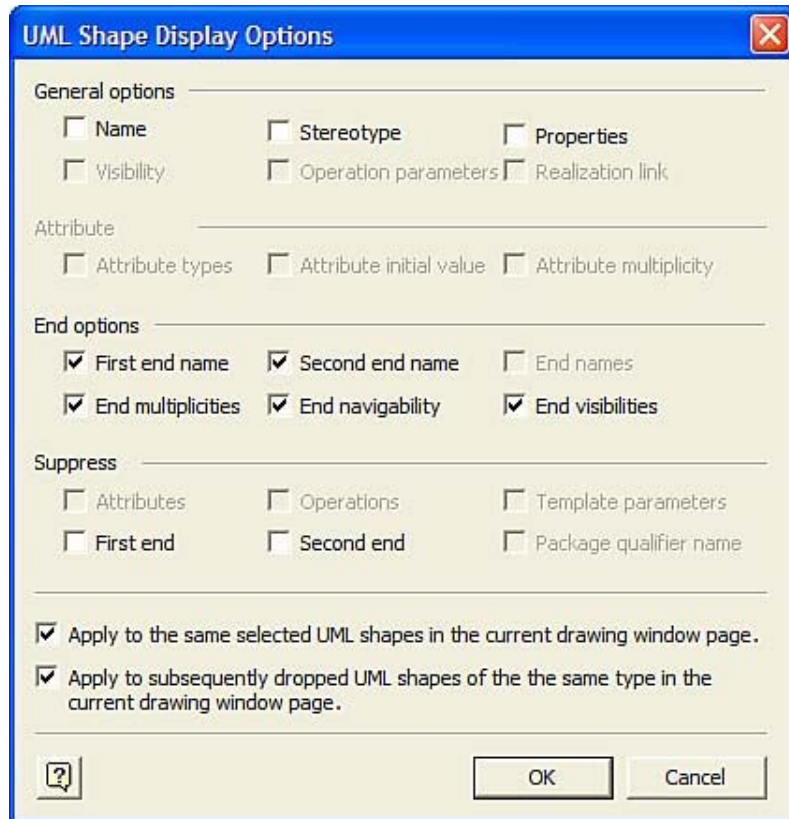
Of course, you're not through yet. You have to add the composition relationship and the inheritance relationship. Start with the composition. Dragging a composition from Shapes into the Drawing page, connecting the filled diamond to Planetary System, and connecting the other end (the "tail") to Star result in [Figure B.18](#).

Figure B.18. Starting the composition.



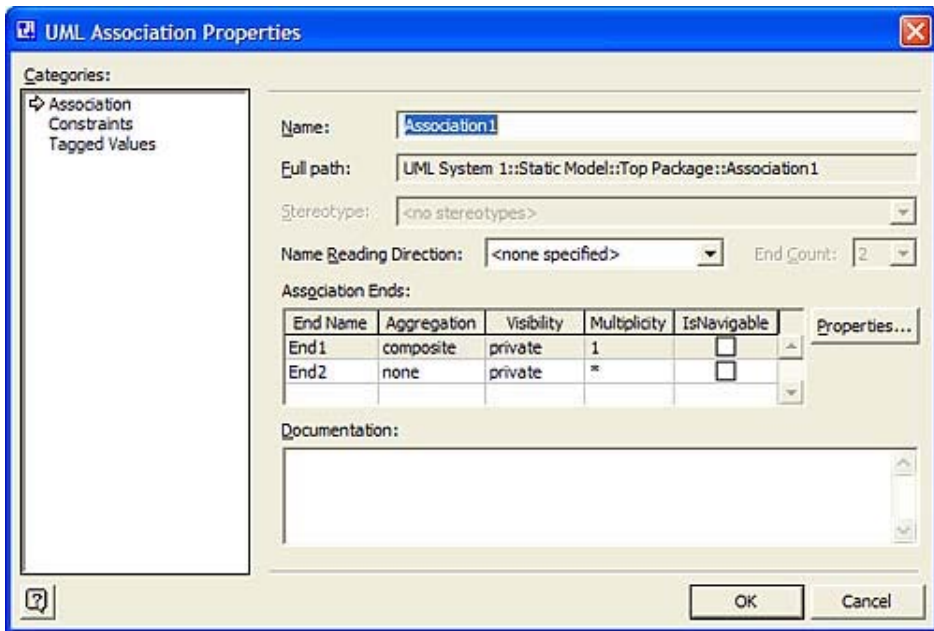
As you can see, you have multiplicities, visibilities, and default names for the ends of the composition. To take the default names and visibilities (-End1 and -End2) out of the diagram, right-click on the composition and select Shape Display Options from the popup menu. This time, in the UML Shape Display Options dialog box (Figure B.19), uncheck First End Name, Second End Name, and End Visibilities.

Figure B.19. The UML Shape Display Options dialog box for the composition symbol.



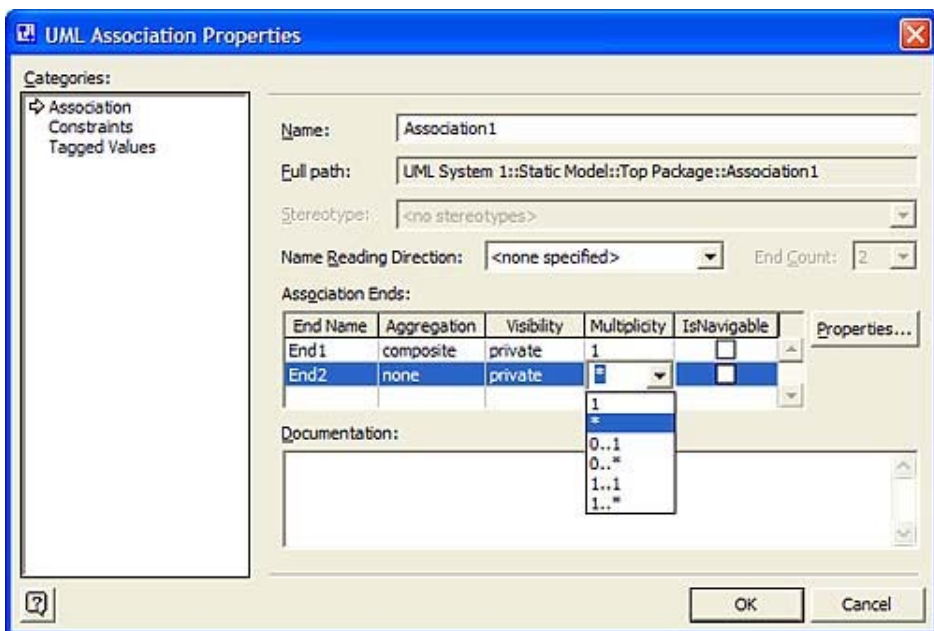
Now you have to take care of the multiplicity for the **Star** class. Double-clicking on the composition symbol opens the UML Association Properties dialog box (Figure B.20).

Figure B.20. The UML Association Properties dialog box.



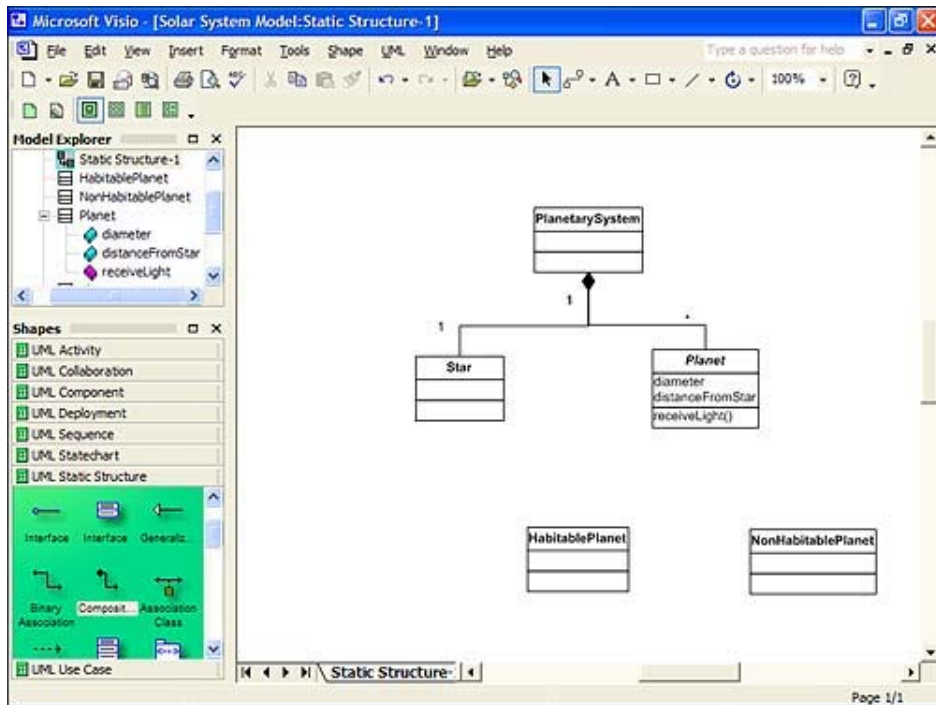
In the Association Ends table, select End2 and click in its cell in the Multiplicity column. Clicking the down arrow in that cell reveals a list of possible multiplicity expressions for End2. If you select 1 from that list and click OK, you'll have the desired multiplicity ([Figure B.21](#)).

Figure B.21. The list of possible multiplicities.



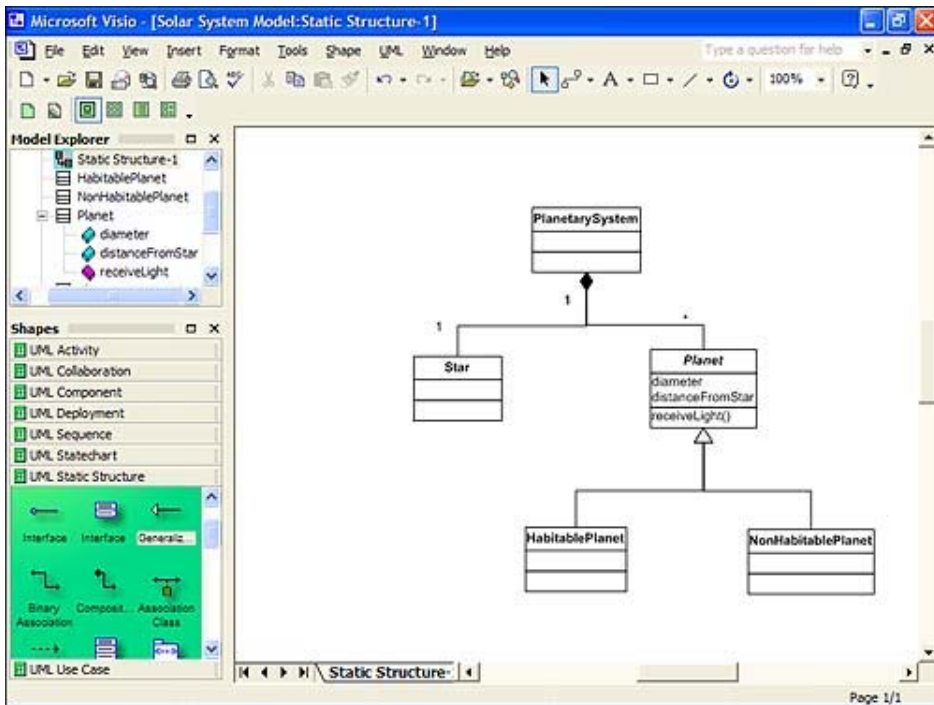
Dragging and dropping another composition symbol, superimposing the diamond on the first, and connecting the tail to the Planet class gives you [Figure B.22](#). The default multiplicity ("many," as denoted by the asterisk) is appropriate.

Figure B.22. Completing the composition.



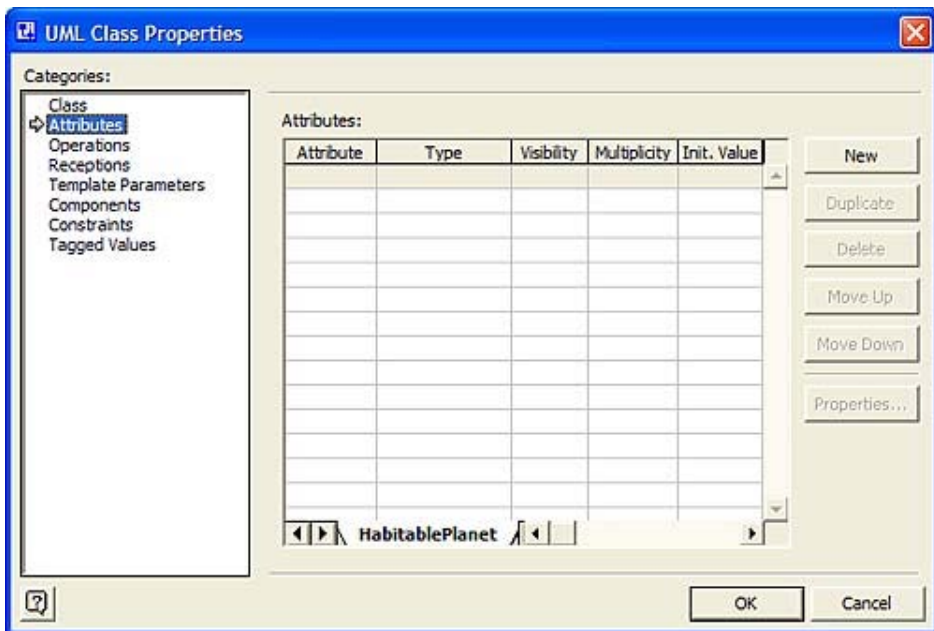
Finally, you'll add the inheritance relationships. Drag and drop a generalization symbol from Shapes and connect the triangle indicator to **Planet** and the tail to **HabitablePlanet**. Do the same thing with another generalization symbol, superimposing the triangle on the first and connecting the tail to **NonHabitablePlanet**. When you're finished, the Drawing page shows the completed class diagram ([Figure B.23](#)).

Figure B.23. The completed class diagram.



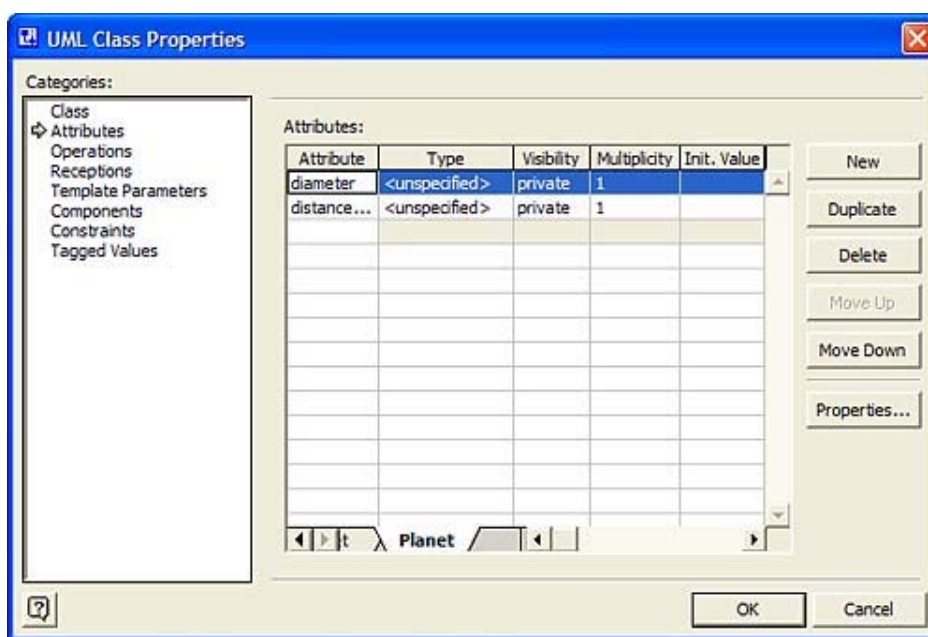
As I mentioned earlier, however, when you use a modeling tool, the information is not just in the diagrams. It's also in the dialog boxes that sit behind the diagrams. You're at a point where I can give you an example. If you double-click on **HabitablePlanet**, the UML Class Properties dialog box appears. Clicking on Attributes in the Categories field opens the Attributes table, as shown in [Figure B.24](#).

Figure B.24. The Attributes table for the **HabitablePlanet** class.



At the bottom of the Attributes table, you see a tab. This tab indicates that you're looking at the page of attributes for `HabitablePlanet`. That page, of course, is empty because you didn't specify any attributes for this class. But `HabitablePlanet` inherits a couple of attributes from `Planet`, and this table shows them. The tabs are scrollable, and if you scroll, you'll see a tab for `Planet`. Clicking on this tab opens the page of attributes for `Planet` (Figure B.25).

Figure B.25. The Attributes table for the `Planet` class opens up in the dialog box for `HabitablePlanet`.

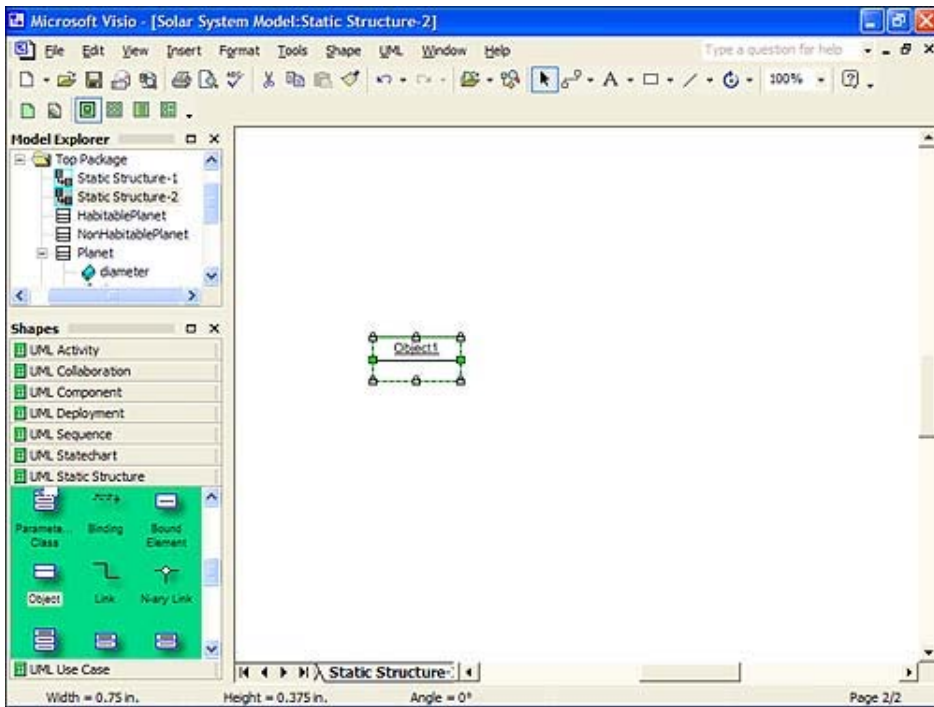


So, because of the inheritance indicator in the diagram, the dialog box for the subclasses shows the attributes for the class from which they inherit. (Visio does this for operations as well.)

The Object Diagram

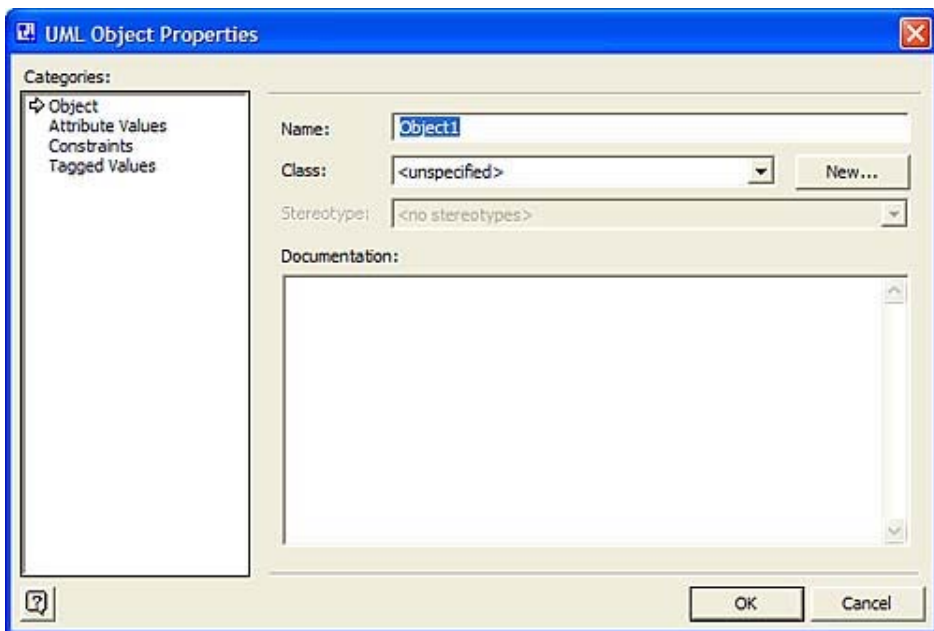
To get started on the object diagram, right-click in Model Explorer on the package icon labeled Top Package. A sequence of popup menus enables you to open a new Static Structure Diagram. From UML Static Structure in Shapes, select an Object icon and drop it on the Drawing page. Figure B.26 shows what the Drawing page looks like after this.

Figure B.26. The Drawing page after with a newly added Object icon.



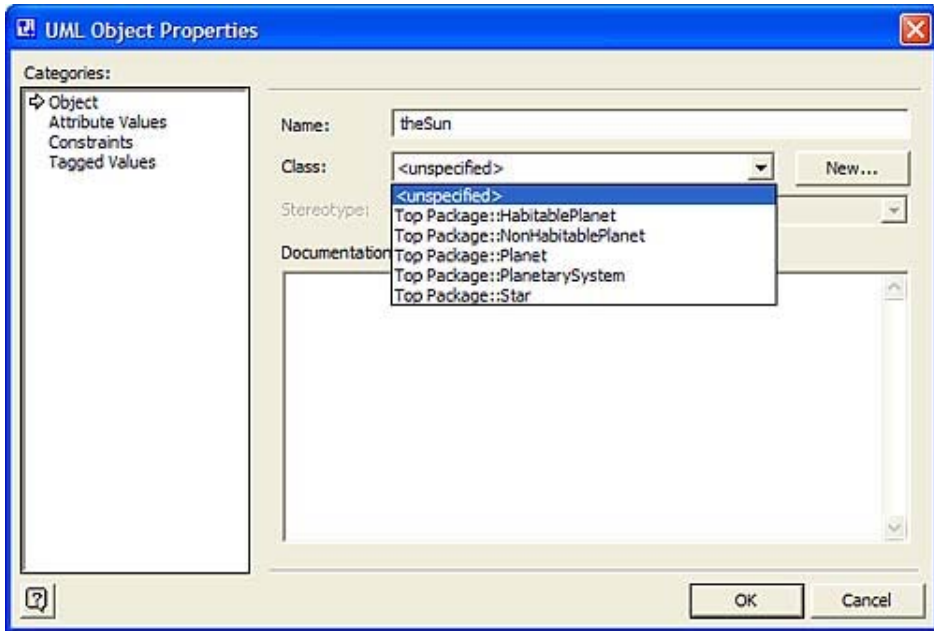
Double-clicking on the object opens the UML Object Properties dialog box ([Figure B.27](#)).

Figure B.27. The UML Object Properties dialog box.



In the Name field, type **theSun** to change from the default name (**Object1**). You also have to indicate that **theSun** is an instance of the **Star** class. To do this, click in the Class field and click the down arrow. This opens a list of classes you created. [Figure B.28](#) shows how the dialog box looks when you do all this.

Figure B.28. The UML Object Properties dialog box, with the object renamed and the list of the classes.



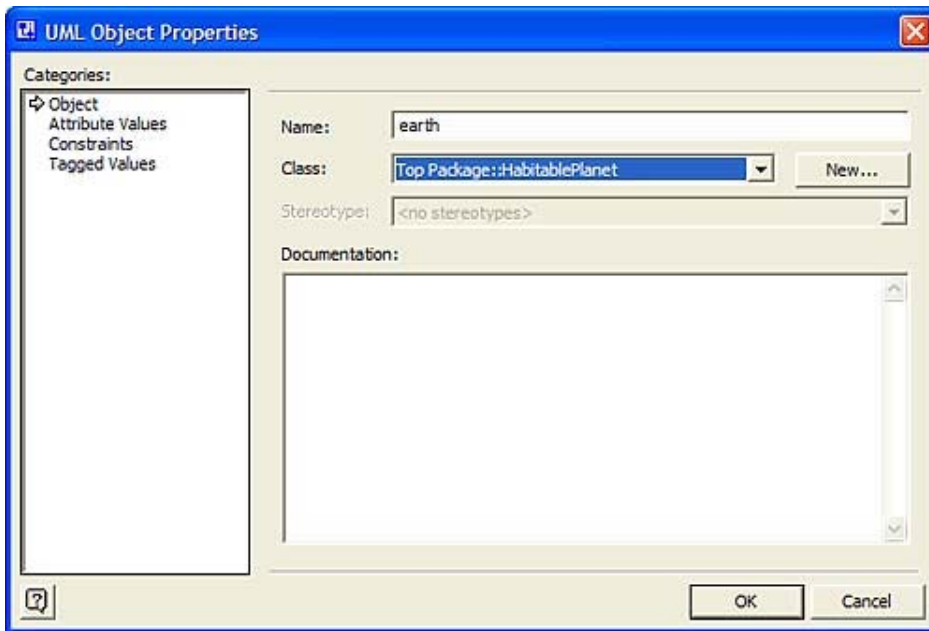
Selecting **Star** from the list of classes and clicking OK makes the object appear as in [Figure B.29](#).

Figure B.29. The renamed sun-object showing the name of its class.



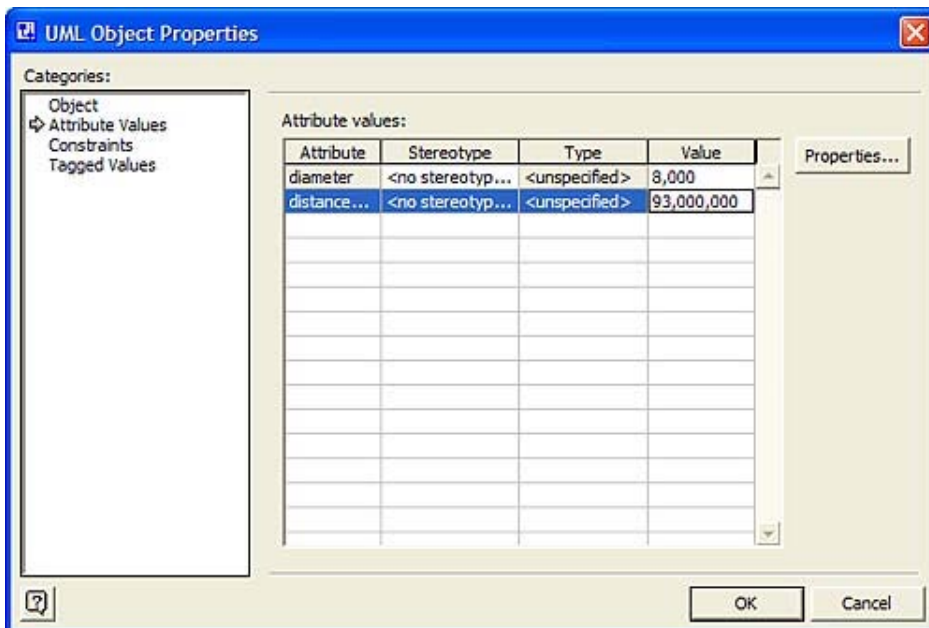
Next, the same series of steps creates an earth-object. [Figure B.30](#) shows the UML Object Properties dialog box after renaming the object and selecting its class.

Figure B.30. The UML Object Properties dialog box after renaming the earth-object and selecting its class.



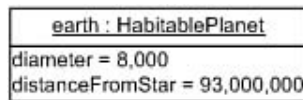
Selecting Attribute Values from the Categories field opens the Attribute Values table. In this table you fill in the values for the `diameter` and `distanceFromTheStar` properties that `HabitablePlanet` inherits from `Planet` (Figure B.31). Remember, you didn't put those attributes into the `HabitablePlanet` class. The modeling tool supplies them for you here because of the inheritance relationships you set up in the class diagram.

Figure B.31. Supplying values for an object's attributes.



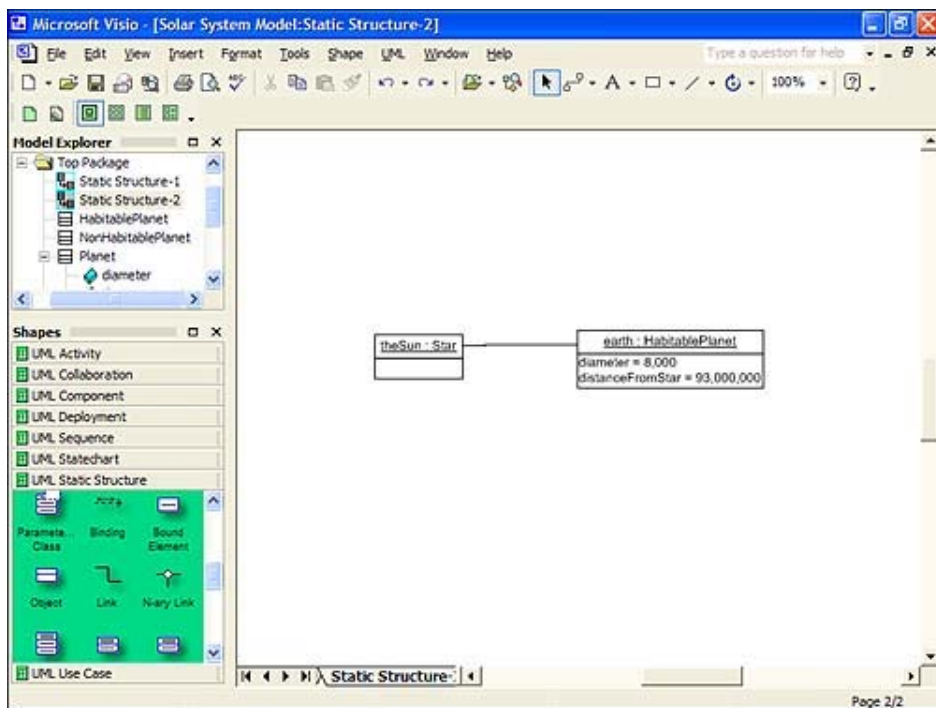
As the figure shows, I supplied the values (8,000 and 93,000,000) in the Values column. Clicking OK makes the earth-object appear as in Figure B.32.

Figure B.32. The renamed earth-object along with the values of its attributes.



All that's left is to add the link between the two objects. Drag a link symbol from UML Static Structure to the Drawing page and connect an end to each object. The names End1 and End2 show up when you do this, but right-clicking on the link and working with Shape Display Options enables you to remove them from the diagram. The completed object diagram appears in [Figure B.33](#).

Figure B.33. The completed object diagram.

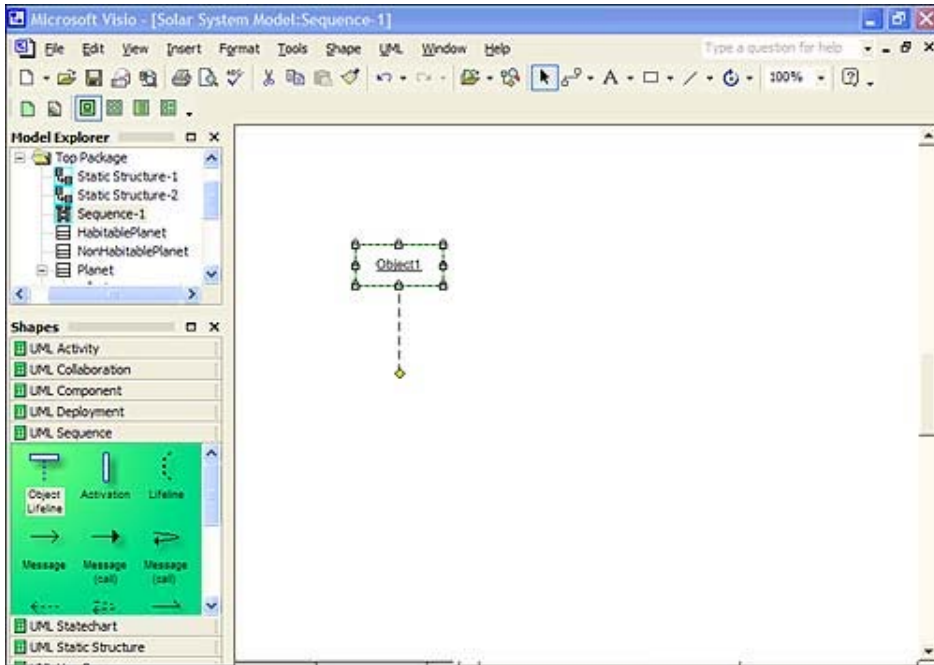


The Sequence Diagram

Let's finish up. Once again, right-clicking in Model Explorer (on the Top Package icon) and selecting from a sequence of popup menus opens a new Drawing page and opens the UML Sequence tab in Shapes.

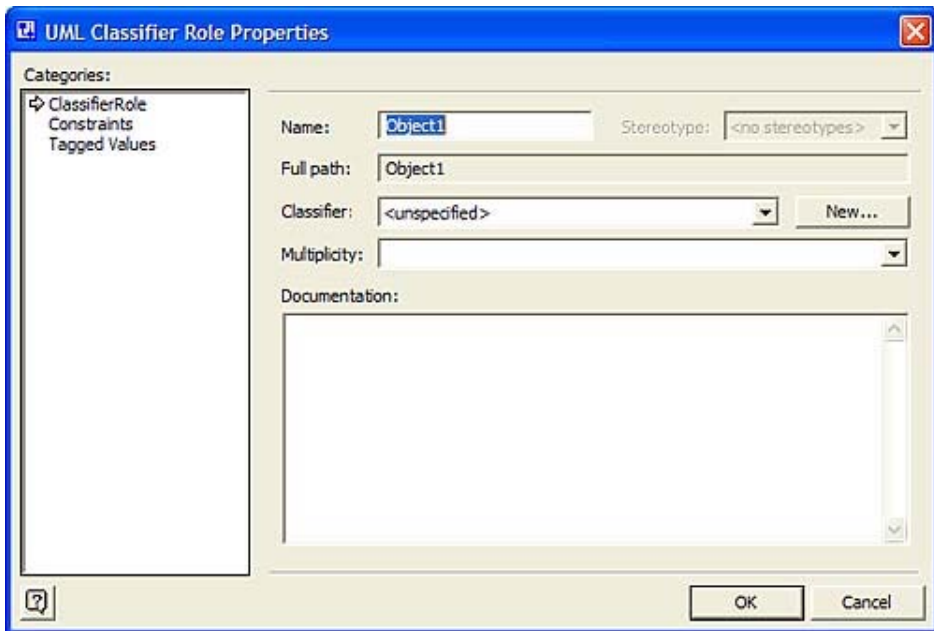
From UML Sequence, dragging an Object Lifeline icon and dropping it on the Drawing page makes Visio look like [Figure B.34](#).

Figure B.34. Starting the sequence diagram with an Object Lifeline icon.



As you did with the Object diagram, rename the icon and show its class. Double-clicking on the icon opens the UML Classifier Roles dialog box (Figure B.35).

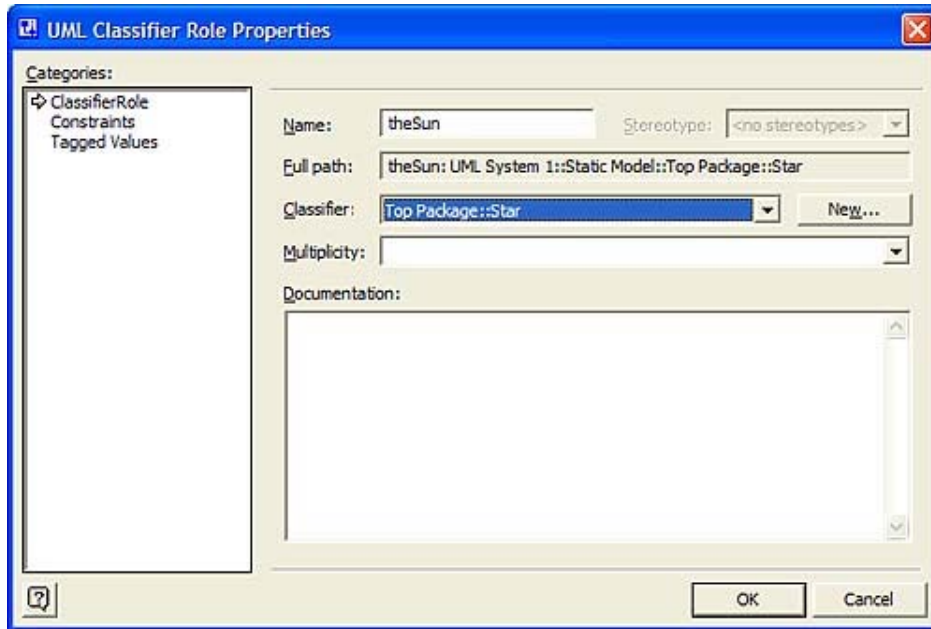
Figure B.35. The UML Classifier Roles dialog box.



After renaming the object in the Name field and selecting its class from the list of your classes

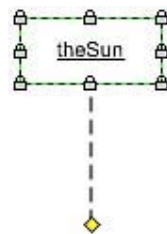
in the Classifier field, this dialog box appears as in [Figure B.36](#).

Figure B.36. The UML Classifier Roles dialog box after renaming the object and selecting its class.



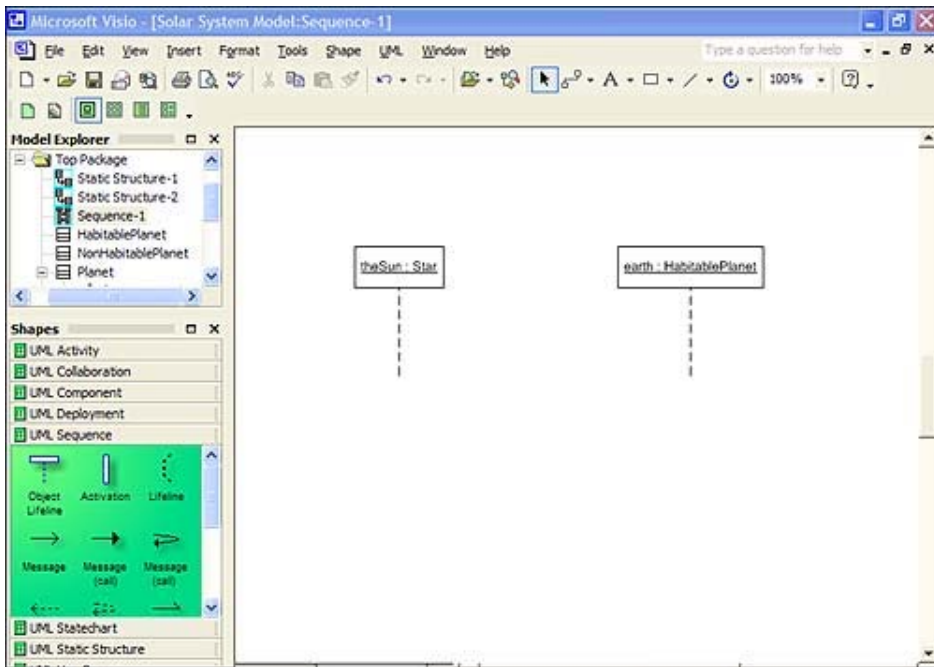
Clicking OK makes the Object Lifeline icon look like [Figure B.37](#).

Figure B.37. The appearance of the Object Lifeline after renaming the object and selecting its class.



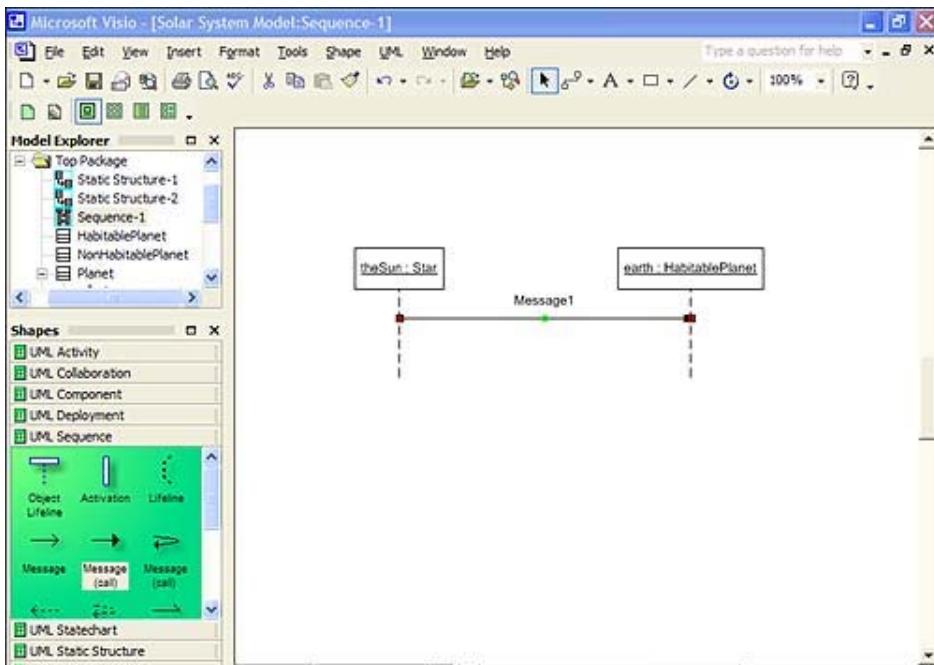
Right-clicking and working with Shape Display Options allows you to show the class name. Following a similar series of steps with another Object Lifeline icon (to represent Earth) results in [Figure B.38](#).

Figure B.38. Two Object Lifeline icons, showing the names and classes of the objects.



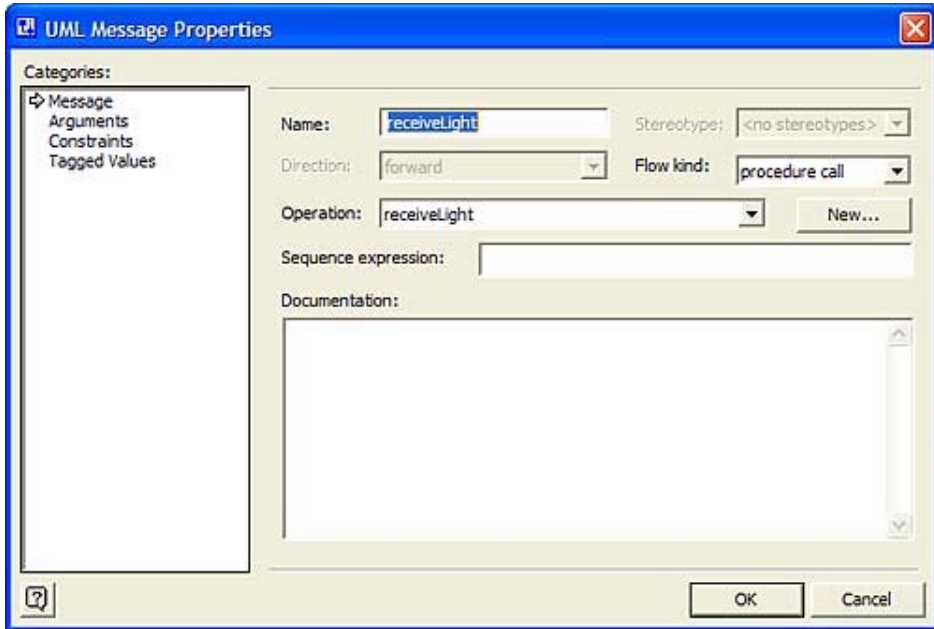
Now it's time for the message from the sun-object to the earth-object. Select a Message symbol from UML Sequence, drag it to the Drawing page, connect the tail to the sun-object's lifeline and the arrowhead to the earth-object's lifeline ([Figure B.39](#)).

Figure B.39. Connecting the two lifelines with a message.



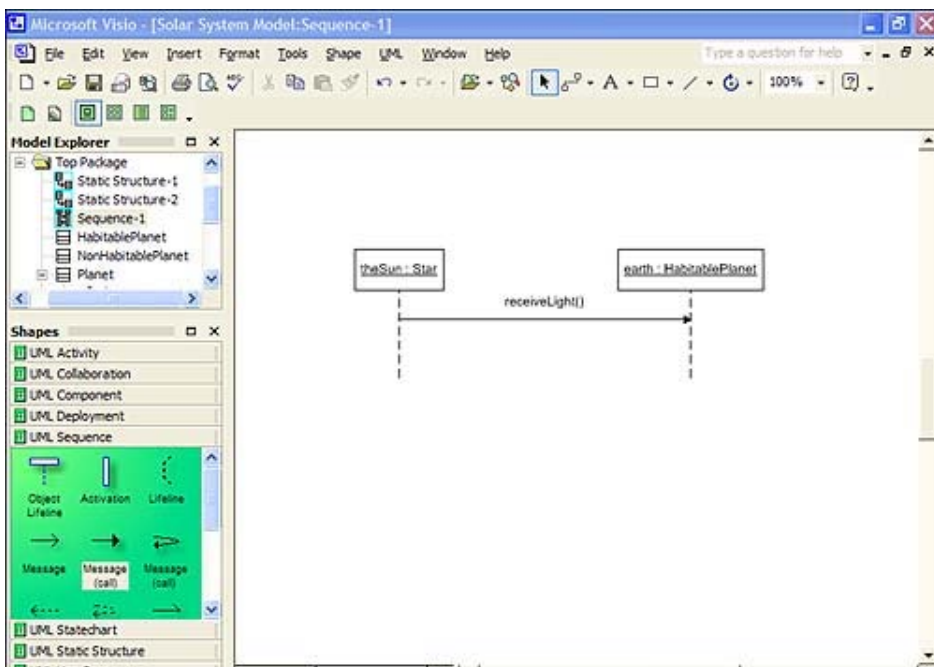
To change from the message's default label, double-click on the message icon to open (you guessed it) the UML Message Properties dialog box ([Figure B.40](#)).

Figure B.40. The UML Message Properties dialog box.



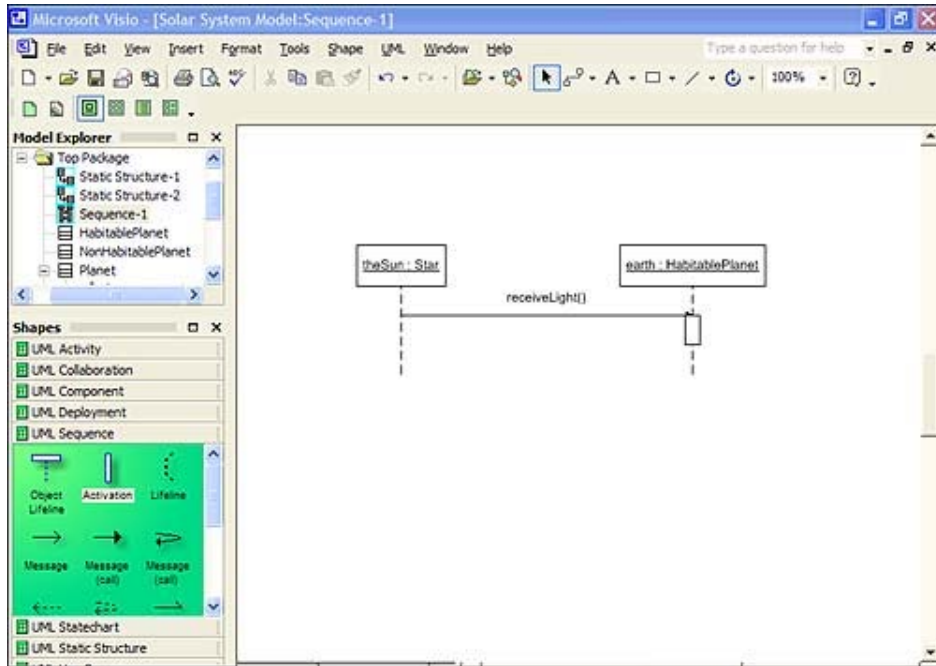
With only one possible operation, the name (in the Name field) and the operation that the message requests from the earth-object are already selected. (Had you specified more operations for this class in your class diagram, you would have chosen from a list of operations here.) Clicking OK puts that operation on the message, as in [Figure B.41](#).

Figure B.41. The relabeled message connecting the two lifelines.



Dragging and dropping an Activation symbol completes the diagram ([Figure B.42](#)).

Figure B.42. The completed sequence diagram.



A Few Words About a Few Tools

In this section, I revisit a few old friends and describe some of their recent developments. As I write this, these tools still comply with UML 1.x (as does the version of Visio I walked you through).

Rational Rose

Still the gold standard in UML modeling tools, Rational Rose is a product of the company where the Three Amigos created UML. Renamed IBM Rose XDE Modeler to reflect IBM's acquisition of Rational, Rose has spawned a variety of tools for modeling in numerous contexts. One is intended for database modeling, another is for working with Microsoft Visual Studio, and still another is aimed at Java. Visit <http://www.ibm.com/rational> for more information.

Select Component Architect

This tool is the updated and extended version of Select Enterprise, one of the first UML modeling tools I worked with. I described Select Enterprise in editions 1 and 2. Select Component Architect is geared toward development via reusable software components and provides UML extensions for that purpose. It also includes capabilities for database design via entity-relationship diagrams.

As one of the tools in the Select Component Factory, it's part of Select Business Solutions' effort to generally provide and promote component-based development. Their Web site <http://www.selectbs.com> will tell you all about it.

Visual UML

Now in Version 3.2, Visual UML continues to be a personal favorite. In fact, I used an earlier version of this tool to create many of the diagrams in the first edition. Its opening screen is so easy to use, you'll be diagramming in UML almost as soon as you finish installation. Go to <http://www.visualuml.com> to learn more about Visual UML and to download a trial copy.