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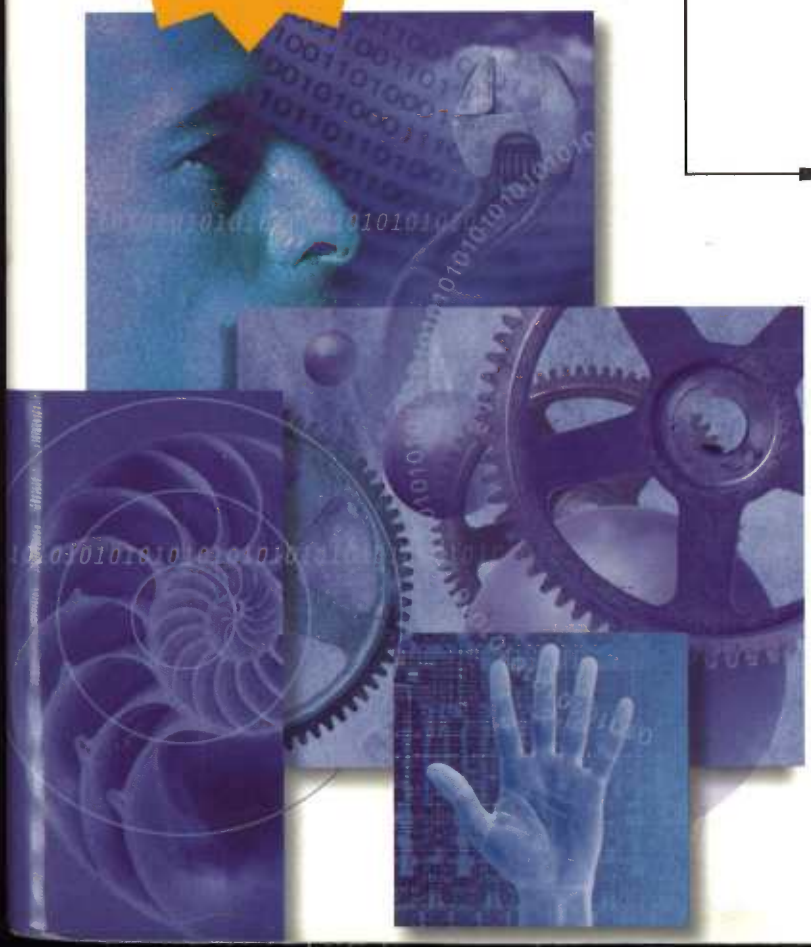

Master object-oriented programming techniques for rapid 32-bit development

Francesco Balena

Foreword by James Fawcette
Publisher of *Visual Basic Programmer's Journal*

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```
    cmdClose.Caption = rs.LoadResString(rsClose)
    cmdRefresh.Caption = rs.LoadResString(rsRefresh)
    ' (Other string assignments omitted...)
    Set imgFlag.Picture = rs.LoadResPicture(rpFlag)
End Sub
```

Because the MyApplication000.Resource class declares enumerated constants for all the strings and other resources in the satellite DLL, you can use IntelliSense to speed up the development phase and produce a more readable and self-documenting code at the same time.

MULTITHREADED ACTIVEX COMPONENTS

Both Visual Basic 5 and 6 can create multithreaded ActiveX components. Components built with the first release of Visual Basic 5, however, could only support multithreading if they had no user interface, which is a serious limitation in some cases. This restriction was lifted in Service Pack 2.

Threading Models

In a nutshell, multithreading is the ability to execute different code portions of an application at the same time. Many popular Windows applications are multithreaded. For example, Microsoft Word uses at least two threads, and the Visual Basic environment uses five threads. Multiple threads are a good choice when you need to execute complex tasks in the background (for example, paginating a document) or when you want to keep the user interface responsive even when your application is doing something else. Multiple threads are especially necessary when you're building *scalable* remote components that have to serve hundreds of clients at the same time.

There are two main types of threading models: *free threading* and *apartment threading*. In the free-threading model, each thread can access the entire process's data area and all threads share the application's global variables. Free threading is powerful and efficient, but it's a nightmare even for most experienced programmers because you must arbitrate among all the shared resources, including variables. For example, even an innocent statement such as

```
If x > 1 Then x = x - 1     ' X should always be greater than 1.
```

can create problems. Imagine this scenario: Thread A reads the value of the *x* variable and finds that it is 2, but before it executes the Then portion of the statement, the CPU switches to Thread B. Thread B happens to be executing the same statement (an unlikely but not impossible circumstance), finds that *x* is 2, and therefore decrements it to 1. When Thread A regains the control of the CPU, it decrements the variable to 0, which is an invalid value that will probably cause other logic errors later in the program's life.

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The apartment-threading model solves these problems by encapsulating each thread in an *apartment*. Code executed in a given apartment can't access variables belonging to other apartments. Each apartment has its own set of variables, so if two threads are accessing the *x* variable at the same time, they're actually referencing two different memory locations. This mechanism neatly solves the synchronization problem described earlier, and for this reason the apartment-threading model is inherently safer than the free-threading model. In Visual Basic, you can build ActiveX components that support the apartment model only.

Multithreaded ActiveX EXE Components

Visual Basic 5 and 6 let you create out-of-process servers that create an additional thread when a client instantiates a new object. All you need to do to transform a regular ActiveX EXE component into a multithreaded component is select an option in the General tab of the Project Properties dialog box. (See Figure 16-18.) There are three possible settings. The default setting is the Thread Pool option with 1 thread; this corresponds to a single-threaded component.

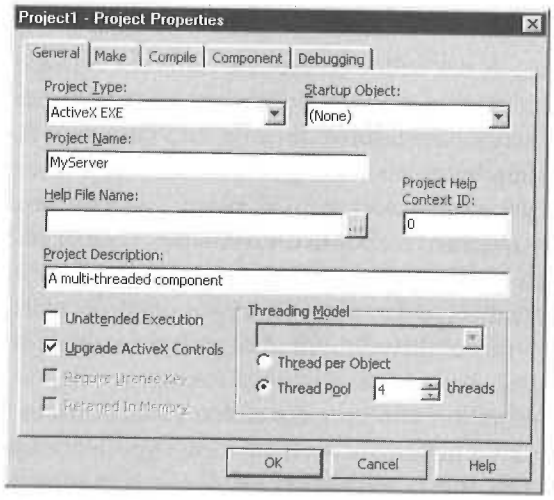

Figure 16-18. *Create a multithreaded component with a few mouse clicks in the Project Properties dialog box.*

If you select the Thread Per Object option, you build a multithreaded component that creates a new thread for every object requested by its clients. Because all objects are executed in their own threads, no client can ever block another client, so these components are highly responsive. The disadvantage of this approach is that too many threads can bring even a powerful system to its knees because Windows has to spend a lot of time just switching from one thread to the other.

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