



Framework Design Guidelines: Conventions, Idioms, and Patterns for Reusable .NET Libraries

By Krzysztof Cwalina, Brad Abrams



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This book can improve the work of any .NET developer producing code that other developers will use. An added benefit is a collection of annotations to the guidelines by various members of the Microsoft .NET Framework and WinFX teams, which provide a lively discussion of the motives behind the guidelines, along with examples of good reasons for breaking the guidelines.

Microsoft architects Krzysztof Cwalina and Brad Abrams offer guidelines for framework design from the top down. From their long experience and deep insight, you will learn

- The general philosophy of framework design
- Principles and guidelines that are fundamental to overall framework design
- Naming guidelines for the various parts of a framework, such as namespaces, types, and members
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Editorial Review

From the Back Cover

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About the Author

Krzysztof Cwalina is a Program Manager on the Common Language Runtime team at Microsoft Corporation. He began his career at Microsoft designing APIs for the first release of the .NET Framework. He has been responsible for several namespaces in the Framework, including System.Collections, System.Diagnostics, System.Messaging, and others. He was also one of the original members of the FxCop team. Currently, he is leading a companywide effort to develop, promote, and apply the design guidelines to the .NET Framework and WinFX. Krzysztof graduated with a B.S. and an M.S. in computer science from the University of Iowa.

Brad Abrams was a founding member of both the Common Language Runtime and .NET Framework teams at Microsoft, where he is currently a Lead Program Manager. Brad has been involved with WinFX and Windows Vista efforts from the beginning. His primary role is to ensure consistency and developer productivity of the .NET Framework through Vista and beyond. His popular blog can be found at <http://blogs.msdn.com/BradA/>.

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This book, *Framework Design Guidelines*, presents best practices for designing frameworks, which are reusable object-oriented libraries. The guidelines are applicable to frameworks ranging in size and in their scale of reuse:

- Large system frameworks, such as the .NET Framework, usually consisting of thousands of types and used by millions of developers.
- Medium-size reusable layers of large distributed applications
- or extensions to system frameworks, such as the Web Services
- Enhancements.

- Small components shared among several applications; for example, a grid control library.

It is worth noting that this book focuses on design issues that directly affect the programmability of a framework (publicly accessible APIs). As a result, we generally do not cover much in terms of implementation details. Just like a user interface design book doesn't cover the details of how to implement hit testing, this book does not describe how to implement a binary sort, for example. This scope allows us to provide a definitive guide for framework designers instead of being yet another book about programming.

These guidelines were created in the early days of .NET Framework development. They started as a small set of naming and design conventions but have been enhanced, scrutinized, and refined to a point where they are generally considered the canonical way to design frameworks at Microsoft. They carry the experience and cumulative wisdom of thousands of developer hours over three versions of the .NET Framework. We tried to avoid basing the text purely on some idealistic design philosophies, and we think its day-to-day use by development teams at Microsoft has made it an intensely pragmatic book.

The book contains many annotations that explain trade-offs, explain history, amplify, or provide critiquing views on the guidelines. These annotations are written by experienced framework designers, industry experts, and users. They are the stories from the trenches that add color and setting for many of the guidelines presented.

To make them more easily distinguished in text, namespace names, classes, interfaces, methods, properties, and types are set in monospace font. The book assumes basic familiarity with .NET Framework programming. A few guidelines assume familiarity with features introduced in version 2.0 of the Framework. If you are looking for a good introduction to Framework programming, there are some excellent suggestions in the Suggested Reading List at the end of the book.

Guideline Presentation

The guidelines are organized as simple recommendations using *Do*, *Consider*, *Avoid*, and *Do not*. Each guideline describes either a good or bad practice and all have a consistent presentation. Good practices have a check mark in front of them, and bad practices have an X in front of them. The wording of each guideline also indicates how strong the recommendation is. For example, a *Do* guideline is one that should always¹ be followed (all examples are from this book):

DO name custom attribute classes with the suffix "Attribute."

```
public class ObsoleteAttribute : Attribute { ... }
```

On the other hand, *Consider* guidelines should generally be followed, but if you fully understand the reasoning behind a guideline and have a good reason to not follow it anyway, you should not feel bad about breaking the rules:

CONSIDER defining a struct instead of a class if instances of the type are small and commonly short-lived or are commonly embedded in other objects.

Similarly, *Do not* guidelines indicate something you should almost never do:

DO NOT assign instances of mutable types to read-only fields.

Less strong, *Avoid* guidelines indicate that something is generally not a good idea, but there are known cases where breaking the rule makes sense:

AVOID using `ICollection` or `ICollection` as a parameter just to access the `Count` property.

Some more complex guidelines are followed with additional background information, illustrative code samples, and rationale:

DO implement `IEquatable` on value types. The `Object.Equals` method on value types causes boxing and its default implementation is not very efficient because it uses reflection. `IEquatable.Equals` can offer much better performance and can be implemented so it does not cause boxing.

```
public struct Int32 : IEquatable {  
    public bool Equals(Int32 other){ ... }  
}
```

Language Choice and Code Examples

One of the goals of the Common Language Runtime is to support a variety of programming languages: those provided by Microsoft, such as C++, VB, and C#, as well as third-party languages such as Eiffel, COBOL, Python, and others. Therefore, this book was written to be applicable to a broad set of languages that can be used to develop and consume modern frameworks. To reinforce the message of multilanguage framework design, we considered writing code examples using several different programming languages. However, we decided against this. We felt that using different languages would help to carry the philosophical message, but it could force readers to learn several new languages, which is not the objective of this book.

We decided to choose a single language that is most likely to be readable to the broadest range of developers. We picked C#, because it is a simple language from the C family of languages (C, C++, Java, and C#), a family with a rich history in framework development.

Choice of language is close to the hearts of many developers, and we offer apologies to those who are uncomfortable with our choice.

About This Book

This book offers guidelines for framework design from the top down.

Chapter 1 is a brief introduction to the book, describing the general philosophy of framework design. This is the only chapter without guidelines.

Chapter 2, "Framework Design Fundamentals," offers principles and guidelines that are fundamental to overall framework design.

Chapter 3, "Naming Guidelines," contains naming guidelines for various parts of a framework, such as namespaces, types, members, and common design idioms.

Chapter 4, "Type Design Guidelines," provides guidelines for the general design of types.

Chapter 5, "Member Design," takes it a step further and presents guidelines for the design of members of types. Chapter 6, "Designing for Extensibility," presents issues and guidelines that are important to ensure appropriate extensibility in your framework.

Chapter 7, "Exceptions," presents guidelines for working with exceptions, the preferred error reporting mechanisms.

Chapter 8, "Usage Guidelines," contains guidelines for extending and using types that commonly appear in frameworks.

Chapter 9, "Common Design Patterns," offers guidelines and examples of common framework design patterns.

Appendix A contains a short description of coding conventions used in this book. Appendix B describes a tool called FxCop. The tool can be used to analyze framework binaries for compliance with the guidelines described in this book. A link to the tool is included on the DVD that accompanies this book.

Appendix C is an example of an API specification that framework designers within Microsoft create when designing APIs.

Included with the book is a DVD that contains several hours of video presentations covering topics presented in this book by the authors, a sample API specification, and other useful resources.

1. *Always* might be a bit too strong a word. There are guidelines that should literally be always followed, but they are extremely rare. On the other hand, you probably need to have a really unusual case for breaking a "Do" guideline and still have it be beneficial to the users of the framework.

Users Review

From reader reviews:

Peter Cox:

The book Framework Design Guidelines: Conventions, Idioms, and Patterns for Reusable .NET Libraries give you a sense of feeling enjoy for your spare time. You need to use to make your capable far more increase. Book can for being your best friend when you getting pressure or having big problem using your subject. If you can make reading a book Framework Design Guidelines: Conventions, Idioms, and Patterns for Reusable .NET Libraries for being your habit, you can get considerably more advantages, like add your capable, increase your knowledge about many or all subjects. You can know everything if you like open and read a publication Framework Design Guidelines: Conventions, Idioms, and Patterns for Reusable .NET Libraries. Kinds of book are a lot of. It means that, science guide or encyclopedia or others. So , how do you think about this reserve?

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Caleb Hutto:

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